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Duplex Milling Machine.

Our illustrations are of a milling machine recently designed and brought out by Beaman & Smith, Providence, R. I. This machine is designed for manufacturing purposes, taking cuts on one side of two pieces or on two sides of one piece at the same time, the article passing between the ends of the spindles and the work done by face mills. These mills usually being made with cast-iron bodies and inserted steel teeth or cutters, which, being made of round tool steel, are cheaply made, easy to maintain, free cutting and quickly adjusted.

The bed is 7 feet long, 18 inches wide, 27 inches deep, well ribbed and very heavy. A section of the top portion of it is shown in Fig 2.

There are two heads—one fixed, the other movable horizontally by means of a screw, to any desired position on the bed, and securely fastened by four large hook head bolts inside and outside of the top of the bed.

The spindles are large, made of hammered steel, and run in bronze boxes, the front bearing being 4⅞ inches diameter, 6 inches long; back bearing, 3⅜ inches diameter, 5 inches long. The section shown in Fig. 3 is of the driving mechanism. The driving pulley is 16 inches diameter for 5-inch belt, and can be run direct to spindle or back geared in the ratio of 4 to 1.

The feed pulley shown in same figure is located directly under the spindle, and is geared up 3 to 1 to get the desired belt speed. The greatest distance from end to end of spindles is 2 feet 6 inches; least distance, 5 inches.

Fig. 2 is a longitudinal section of table, and cross-section of carriage, and also shows the feed mechanism of the table. The carriage is moved on the bed by a screw to the desired position, and then fastened. The table has no vertical adjustment, the article to be operated on being held in a suitable fixture. The top of the table has three T slots, is 40 inches long, 12 inches wide, and has an automatic screw feed of 24 inches—the length and feed can be increased if desired.

The feed shaft shown on front of perspective view of the machine carries a worm (*A*, Fig. 2,) which is of steel, and runs in a bronze worm-wheel, from which motion is carried through two spur gears to the 3-pitch screw, which has a bronze nut fastened to the under side of the table.

The feed is stopped automatically by a stop on the side of the table tripping the starting lever and dropping the worm out of the wheel; the quick-return is by means of the upper shaft with hand-wheel shown in perspective view and connected to the screw through miter gears; the shield shown beyond the end of the screw is to prevent chips and dirt from getting into thread of screw while it is beyond the end of table. The distance from center of spindles to top of table is 10 inches. There are two countershafts, each having a three-section cone, giving six properly arranged speeds to the spindles. The first shaft has tight and loose pulleys 16 inches diameter for a 5-inch belt, and should run about 120 turns a minute. The weight, including two countershafts, is 5,500 pounds.

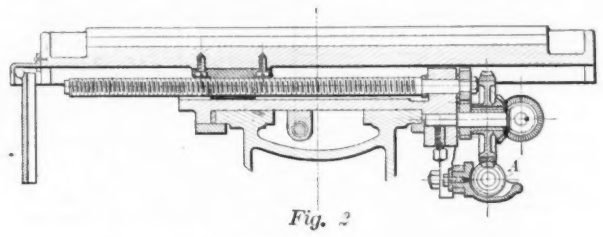


Fig. 2

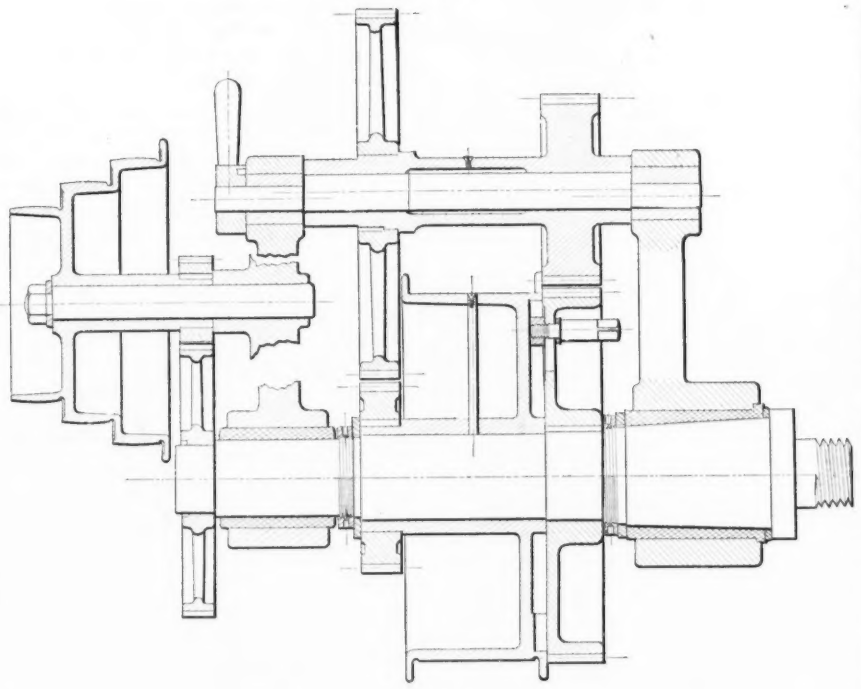
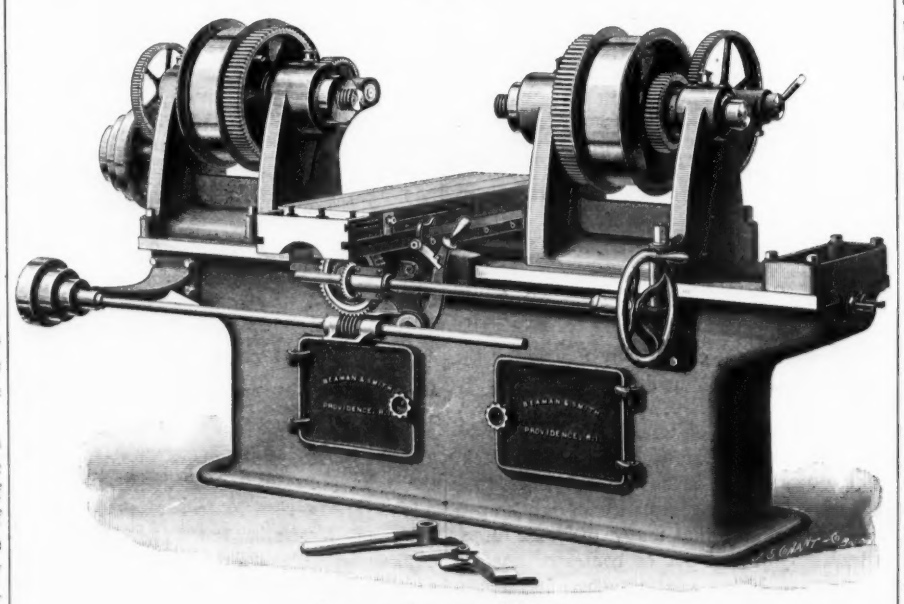


Fig. 3



DUPLEX MILLING MACHINE.

The newspaper of the smallest circulation in the world is that published for the exclusive use of the emperor of Austria, his minister of foreign affairs, and his secretary of state. A fourth copy is never printed. Its contents consist of the criticisms of the journals of the world upon his administration of government. Its annual cost is $80,000.

The *Age of Steel* has, according to a late declaration, never heard of a "machine" capable of delivering 2,500 electric lights; all of which goes to show that our contemporary's early education has been neglected.

Machinists are a long-suffering and patient class of men, but there are some things which exhaust their patience, and render them dangerous. One of these is to be roused at 3.30 A. M. by a burglar, who, when confronted, threatens to shoot. Arthur Valentine, a machinist of Springfield, Mass., had an experience of this kind recently, and instead of allowing himself to be robbed, he remarked sententiously, "Shoot and be——!" and seizing a chair, laid Mr. burglar out, handed him over to the police, and again sought his downy couch. We hope this incident will be taken by all other burglars as a warning to steer clear of all machinists.

Time-Keeping and Cost Account.

The importance of keeping time and cost accounts in modern manufacturing establishments, which shall not only be so arranged as to involve the least possible amount of labor in keeping them, but enable the cost of any job to be accurately ascertained quickly after its completion, or at any stage of its progress, is becoming constantly more generally recognized, and the problem of arranging such systems is one to which a great deal of hard thinking has been devoted; one reason for this being that different establishments doing different kinds of business usually require somewhat differently arranged systems to suit the varying circumstances, so that a shop owner seldom sees a system of shop cost accounts and time keeping which he does not think can be improved upon—at least for his own shop.

The firm of E. E. Garvin & Co., of this city, employ about 275 men upon work which may be divided into four classes, as follows: First, type-writing and similar machines which they manufacture in large numbers upon contract; second, a large variety of machine tools, some of which are built upon orders, but most of them as stock, which, if not sold before completion, go into their warerooms; third, experimental machines, in the building of which considerable expense is involved; and, fourth, small jobs, some of which are ordered, completed and delivered the same day—this latter class of work resulting from their situation in the midst of a district in which manufacturing of almost every conceivable kind is carried on by parties who have no facilities for doing their own special repairing, tool or jobbing work, if, indeed, they would know how to do it if it had the facilities.

From the nature of the case all these classes of work must intermingle to some extent in the shops, and the problem of keeping accounts in such a manner as to avoid complication and be well adapted to each class of work, though it seemed a serious one, has been solved to the entire satisfaction of the firm, their system during several years' trial having developed no weaknesses or flaws worth speaking of. Some of the features of several different systems enter into it, Mr. E. E. Garvin having looked over the field as thoroughly as possible before arranging it.

When an order of any kind is received from a customer, it is entered consecutively in one or the other of two order books, the number of the order being noted first, and following this the name of the customers and sufficient data to identify the job. These books are not special ones, but such as can be purchased anywhere, the entire entry being made with a pen. They are not indexed, the finding of the entry for any particular job depending entirely upon the order numbers which appear in vertical rows at the left of each page. One reason for keeping two of these books is to avoid bulkiness, jobs which are of considerable magnitude, and are liable to be in the shops for some time, being entered in one, while the smaller jobs, likely to be finished in a short time, are entered in the other. But the orders are numbered consecutively, nevertheless, as, for instance, orders 1,051, 1,058, 1,062 being of considerable magnitude, will go in the book devoted to the larger orders,

while numbers 1,052—3—4—5—6—7, 1,059—60—61, which are between the others named, being small jobs, are entered in the other book. When a job is completed and delivered to the customer, or to the warehouse, this entry is stamped in colored ink with a rubber stamp, a large letter D signifying delivery. Having two of these books also avoids the bother which would result from having a few unfilled orders entered in a book long after most of those entered in that book had been canceled. Shop orders, or, in other words, those which simply order machines of a regular line for stock or the warerooms, are entered in the same way, and in the same books.

A large number of blanks—for convenience designated here No. 1—are provided, which are numbered consecutively at the top after the words "Order No.," the one shown being devoted to order number 18,416. At the same time that the order is entered in one of the books described, the blank of corresponding number is filled out with the date, and below the word "description" the necessary directions regarding the job for the guidance of the foremen, the other blank spaces being left unfilled until the completion of the work. If the order is for a regular line of work the "description" may simply be such as "Six No. 2 Screw Machines," but if it is out of the regular order the description may be more extended, there being twenty lines on the blank in which writing can be done. "O. B. Folio," near the top of the blank, means order book folio, and the number or other character designating the particular order book in which the corresponding entry is made, may be filled in there, to facilitate the finding of the entry. This, however, has been found unnecessary, and is seldom used, because the entries can easily be found by the numbers. This blank remains in the shop, in the hands of the foremen, until the job is finished, when it is returned to the office, and the name of the customer giving the order filled in after the words "Received of." When the job is delivered the name of the person to whom it is delivered is filled in with the date, and the medium through which the delivery is made in the spaces designated; and when the bill is made out, or the price of the job charged to the account of the person ordering it, these facts are indicated upon the blank by any suitable hieroglyphics, after which it is filed away.

On Friday mornings each workman receives a blank like No. 2, his name being written at the top. On this blank he enters his time for the following week, which ends on Thursday. The number of the order upon which he is working he obtains of his foreman, and enters in the left-hand column; all time put in on a given job during the given week being entered in the same horizontal line; the vertical column in which it is entered showing the day of the week on which the work was performed. The total of each horizontal line then shows the number of hours' work put in on the designated job during the week, while the totals of the vertical columns show the number of hours' labor performed each day, by the workman whose name is at the top of the blank. These latter totals, added together, should equal the sum of all the totals in the right-hand column. On this blank there are thirty horizontal lines, thus making provision for a workman being employed on that number of different jobs on any one or more days of the week. The words printed at the left of the upper lines are not an essential part of the system, but time is occasionally entered upon those lines when it has been put in upon a regular line of work, the cost of which is sufficiently well known, and which is not ordered by number. The use of this feature would, of course, be optional, and in most cases it would probably be preferred to have all work done upon numbered orders. The timekeeper is provided with blanks like No. 3, one of which is devoted to each order or job, the number of which is entered at the upper right-hand corner; the other blank spaces at the top being filled out to correspond with No. 1. At the left-hand edge of the blanks No. 3 are two perforations, by which they are filed in a "Common Sense" binder—such as is furnished for binding the American Machinist, but, of course, smaller, the blank being 8½"x11". There is one of these blanks in the book for every order upon which work is being done in the shops, the whole making a book which is carried through the shops each morning by the timekeeper in taking the time of the previous day. This time he takes from the cards of the workmen (No. 2.) Supposing the blank No. 3 to be devoted to order No. 18,416, the timekeeper in going his rounds writes at the left the names of the men found to have worked on that job the day previous, except those previously employed upon it, whose names will, of course, be already there. Opposite each name the time put in the previous day upon order No. 18,416 is entered under the proper date, which is noted

Order No. 18416

O. B. Folio ____ *Date,* ____ 188

Received of ____

Delivered to ____

Date of Delivery ____ 188

Delivered by ____

DESCRIPTION

No. 1.

Name ____

For week ending ____

On	Fri.	Sat.	Mon.	Tues.	Wed.	Thu.	Total.
Millers							
Drill Presses							
Hand Lathes							
Shop Tools							
Countershafts							
No.							
"							
"							

No. 2.

Dated ____ *From* ____ *Order No.* ____

Description ____

NAMES. DATE AND HOURS. TOTAL HOURS

No. 3.

Time Sheet for Week Ending Thursday. 188

NAMES	F.	S.	M.	T.	W.	T.	Tot'l	NAMES	F.	S.	M.	T.	W.	T.	Tot'l
M.								M.							
S.								S.							
O.								O.							
M.								M.							
S.								S.							
O.								O.							

No. 4.

at the top of the column in figures for the month and day of the month. Thus, when the job is completed, this blank gives the names of all the men who have been employed upon it, and the time put in by each. There are twenty-seven vertical lines, thus allowing for the performance of work upon a given job on that many different days, which may or may not be consecutive working days. There are forty-four horizontal lines for the entry of names. There may, of course, be duplicate numbers of this blank, if the length of time the job is in the shop, or the number of men employed upon it, exceed these limits, though that rarely occurs; one reason being that certain parts of machines, such as screws, gears, handles, and, in some cases, more complex portions, are made upon separate orders and kept in stock, being charged to other orders as stock, when used upon them.

When a job is completed the timekeeper goes to the stock-rooms, and from the records kept there enters upon the lower part of this same blank the stock used upon the job, after which the blank is pulled out of the binder—without disturbing any of the others—and filed away.

In the front part of this same binder are a number of blanks (No. 4) which are the same size as No. 3, and contain the names of all the men employed. The name of a workman is written in every fourth horizontal line, the three lines below having printed in them the letters *M*, *S* and *O*, as shown, signifying machines and tools for the shop, stock, and orders respectively, the time for each day being entered in the horizontal column devoted to the kind of work employed upon; sometimes, of course, the time for a single day being divided up between two or all three classes of work. The totals on these sheets are compared with those on the forms (No. 2) which are filled out by the men, and any discrepancies investigated. When a small job comes in, which is to be finished and delivered on the day it is received, the blank No. 1 is stamped with a rubber stamp with the words, "Put on time and material"; the foreman then, at the completion of the job, puts upon this blank the name of the man or men employed upon it, with their time and the material used, returning the blank with the finished work, so that the bill can be made out at once, after which a form (No. 3) can be filled out and kept as a record if desired.

It will be seen that this system gives opportunity for getting at the cost of a given piece of work very readily, that it involves no expensive books of record, and, above all, that very little dead matter has to be handled; or, in other words, as soon as a job is completed, all the records relating to that job can be filed away, and future handling of them entirely avoided, except in the case of the order books first mentioned, which are sufficiently small to be readily and easily handled, and not likely to contain many entries of jobs which have been finished, while they yet contain entries of unfinished ones. Besides, these books are used only twice for each job, *i. e.*, when the order is received and when it is completed.

Writing on the Conemaugh dam failure, and on the failure of several reservoirs, Sir Robert Rawlinson concludes a letter to the London *Times* as follows: "And now for the lesson to be learned. Excessive floods may not occur annually, but at rarer intervals. In England rivers occasionally rise some 22 feet or 23 feet vertical in flood; in Scotland and Wales some 30 feet or 35 feet in great spaces, doing great damage within the range of the flooded areas. In South Africa rivers rise 70 feet vertical, and in parts of Australia 120 feet, a small and almost invisible stream in dry weather becoming a devastating torrent during the heavy rains. The rivers flowing down the Conemaugh valley in America from the mountains above will be subject to similar excesses. The great rivers and the great lakes of North America and Canada have, however, capacity to equalize the effect of storms, and so to prevent such excesses as now and then take place over areas of less extent, and which will inevitably be repeated if similar mistakes are made, such as building towns, villages and works in narrow valleys below wide mountain areas and large artificial reservoirs. There may be a very wide interval between the excesses of nature, but there is ever the contingency, nay, certainty, of a repetition, and man cannot alter it."

A correspondent would like to know if some means of dissolving rust in an iron water pipe, so that it will work out without injuring the pipe, is available.

Exposition Notes.

Editorial Correspondence.

The exhibit of machine tools is large, and, of course, interesting, as showing the facilities of the world for making machinery, and as a fair exponent of the state of mechanical skill, including the ability of the engineer to design and the mechanic to execute. There is almost literally nothing that is absolutely novel, so far as the working of metals goes, but some of the exhibits show great ability of design, and corresponding skill in workmanship.

One of the machine tool exhibits most likely to claim the attention of those interested in such matters is that of Steinlen & Co., of Mulhouse, Alsace. It is the finest exhibit of machine tools I have ever seen. This refers to the tools as a whole, including design, material and workmanship. One machine which they exhibit may be described as a large combination milling and planing machine. It carries a cross-rail supported by uprights, similar to a planer, with heads for both milling and planing, two of either of which may be used on the cross-rail at once, and one at the side. The table is gibbed on an angle at each side, and is supported on flat ways; it is given either a motion suitable for planing or for milling, as is desired.

The uprights of this machine, which, as will be inferred, has quite the appearance of an ordinary planer, might be studied with profit by a good many designers of planers. I do not refer particularly to American designers; they do not need the lesson so much as European designers do. From the top to the base these uprights curve out boldly into the form that looks best calculated to resist the strains they are subjected to, and this form—always beautiful—is not marred by any attempt to break in upon its utility by cutting it up into counterforms by perforations or otherwise. The apparently correct proportions leave no room for ornamentation. This certainly improves the appearance, but machinists sometimes object to unperforated uprights, on the plea that they exclude more light. In fact, in the machine throughout, no attempt at ornamentation is made, but the finish is excellent. Gears—bevel and spur—and racks are of steel, hardened, the ends of long screws upon which handles are used are hardened as well as the handles and various other parts, steel being the material used. The tool blocks (clappers) for planing tools are of steel, hardened, and are beveled at the lower end horizontally and vertically, to hold them firm sideways, and to relieve the pin of upward strain when the tool is cutting. This firm also exhibit lathes, slotting machines, drilling machines, milling machines, crank planers, threading machines and a variety of other tools, all of which are of the same excellent design and workmanship as the one for planing and milling. Turret heads of their machines are of steel, hardened and finished by grinding. No argument in favor of the combination feature of the machine referred to is intended. On general principles the policy of such combination is questionable. But if one likes that feature he would be hard to please if that machine did not come pretty near suiting him. Neither do I wish to be understood as advocating or condemning such refinement of work as is found in the Mulhouse exhibit. It would probably be difficult to sell such tools in the United States at the price that they must necessarily bring, but it is plain enough that they are sold in Europe, and at a good round price, too. But outside the question of construction is that of design, which does not materially alter the cost of production.

Steinlen & Co. are one of the few European firms that invited complete inspection of their machines, and willingly gave any desired information. They invited those interested to visit their works, and I was told by one well-known American engineer who did so, that the tools exhibited at the Exposition were no better built or finished than those he saw at the works. I inquired the price of several of their tools, and should think, by comparison with prices in America, that they got paid for the quality of their work. I have no doubt as good work could be done in the United States at about the same cost.

Barquand & Sons, of Paris, exhibit some fine tools, amongst others vertical milling machines. The fault likely to be found with these machines—and from an American standpoint, I believe, properly enough—is that the spindles are quite too small. In strength the spindles appear disproportionate to other parts of the machine. About the easiest thing to do is to put a strong spindle in machines of this kind. Even if other parts of the machine yield under the strains of working, there is no reason for aggravating the case by using a spindle that will not stand up to its duty. A small lathe—perhaps 15 inch swing—exhibited by this firm is very finely made, and is neat in appearance, but it is rather complicated for ordinary purposes. Quite likely, however, it is intended only for very fine work. The screw for the compound rest is operated by bevel gears, so that, with the rest set to feed in line with the traverse of the carriage, the handle stands to the front, or towards the operator. On their tools generally the bearing surface on the Vs is more than twice as great as in American practice. This firm have in their exhibit a foot lathe about 12 inch swing, in which the treadle motion is connected with a "Scotch yoke," the pin on the wheel carrying a roller or small wheel, which works in the slot of the yoke. The yoke stands vertically, with tail pieces extending horizontally, a connecting link at one end taking hold of the treadle, and at the other end of a fixed pin. It is not plain what special advantage, if any, is gained by this construction.

A number of firms showed milling machinery, some of the large vertical machines being excellent examples of design and workmanship. The same is true in regard to slotting machines. I have never seen large machines of these types so well finished as those at the Exposition.

Geo. Richards & Co., of Broadheath, England, show a number of machine tools, noticeable as being strong, heavy machines. A 24-inch lathe is called by the firm their Anglo-American lathe; I do not remember ever to have seen as heavy a lathe of its size. It is well named, being in the main a combination of what were considered the best practices in America and England, and what of originality experience had suggested. I suppose I like this lathe better from the fact that I saw one of them in operation at the Broadheath works under conditions well calculated to show its qualities of strength and stiffness. This firm exhibit a cutting-off machine in which a short head with one set of dogs is used—a tail stock free to be moved along the the bed, and arranged to grip the piece, being employed. Two cutters are used for cutting off. This machine is quite simple in its details, and it does its work well. They also exhibit vertical milling, boring, chucking and slotting machines, and other tools. Mr. Richards very firmly believes that one of the present machine shop needs is the means of removing metal more rapidly, and his machine tools show quite conclusively that he has the courage of his convictions, which, I believe, is the proper expression in the instance of a man doing what he preaches.

A very common upright drill is one with a square or circular table on one side, and a vise on the other side; a very convenient arrangement when there is plenty of room to swing around in. Quite generally the vise is only about one-half the weight of the table, as it would cost only a few pounds of cast-iron to make a balance of it.

In a small and excellently well made foot lathe, the slide and hand rest were mounted on a triangular bar, one flat being at the bottom; this appears to be an improvement over the round rod sometimes used for the same purpose, as there are two sides of a triangle to clamp to, insuring stability and bringing the rests to exact positions. The triangular bar costs more to make than the round rod, but it looks as though it was worth the difference.

A machine for grinding links, or other hardened circular forms, seemed to be well adapted to the purpose, and quite simple in its essential parts. The link is held in a vertical position by radius rods that take hold where the eccentric rods do. These rods are made so that their length can be quickly adjusted to the radius of the link, and both are connected to the same pin at the proper distance above the link, the distance being adjusted by a slide in which the pin is fast. The link is guided at the bottom between the jaws of a vise, the jaws being adjustable by means of a right and left hand screw. The swinging motion is given to the link by means of a connecting rod, which takes hold of a pin in a revolving disk—the pin being adjustable to give the proper stroke—and another pin in the jaw of one of the radius rods above the link. The arbor which carries the emery wheel—the latter appeared to be made upon the arbor, though of that I am not sure—extends through the link, and has a bearing outside. In operation the arbor is given an endlong motion to wear the wheel evenly, and to do true work. The machine referred to is quite elaborately constructed, but could be made very simply and still accomplish its purpose. If properly constructed there will be ample stiffness for grinding links.

A machine by the Northern of France Railway, for grinding links, carries the emery wheel at the end of a vertical spindle, the link lying on its side. The emery wheel at the end of the spindles was a necessity, for the reason that the links have one solid side. This machine is much more complicated than the one previously referred to, but scarcely better, I should think. This last-named railway company also exhibit a machine for milling valve faces, a grinding machine of the type in which the head carrying the emery wheel traverses the bed horizontally, while the work remains stationary on a table on the side of the bed; a portable grinding machine driven by rope belting, and a machine, similarly driven, for tapping for stay bolts, and drilling or reaming the holes when necessary. It would appear that this company made a good many of the tools they use.

A Paris firm exhibit several machines for sawing metal, cold. There is a large band saw for cutting out the throws of cranks, smaller band saws for lighter work, and large and small circular saws for metal. From observations of the use of such saws in shops in England and France, it seems strange that they are not more commonly employed in the United States.

In emery wheels and frames there are good exhibits, as well as in more complete machines for accurate work.

There are a good many exhibits of lathes, most of which have the appearance of being excellent tools, but costly to make. In fact, in the European exhibit of machine tools, outside those from England, little expense appears to be spared. They would be costly machines if made in the United States, and I do not think the cost is much less—a little less cost of material, no doubt—in Europe.

It is evident, and it is worth repeating, that European manufacturers are willing to pay more for machine tools than American manufacturers are.

There are but few American exhibitors of machine tools. The Brown & Sharpe Manufacturing Company have a fine exhibit of their well-known standard machines—milling machines, chucking machines, grinding machines for various purposes, screw machines, milling cutters and attachments, etc. This company also have an excellent exhibit of small tools, such as squares, standard scales, micrometers, vernier calipers, etc., etc., which appears to me to be superior to anything of the kind shown by European exhibitors.

Warner & Swasey exhibit ten brass-working machines, and their exhibit is instructive, in that it represents one line of work that these machines are adapted for, that is, the manufacture of globe valves. Each of the machines holds a part of a valve in condition to be operated upon. It is needless to tell those acquainted with the work done by this firm that their exhibit is a good one; it is more complete in its way than any similar exhibit at the Exposition.

The Tanite Company, or their representatives, show emery grinding machinery, but, like several other American exhibits, theirs is so placed as not to be in much danger of being seen.

Stiles & Parker and E. W. Bliss have power presses and hammers on exhibit, but there is not much intention of the part of any one to call attention to them, or to give information regarding them.

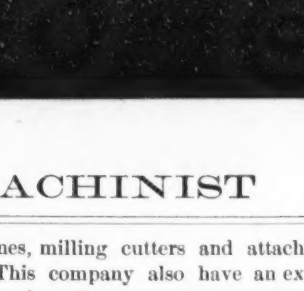


FIG. 1.

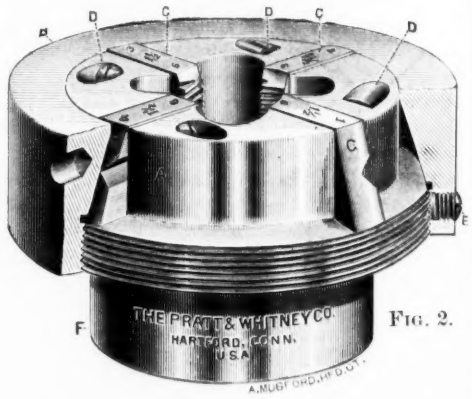


FIG. 2.

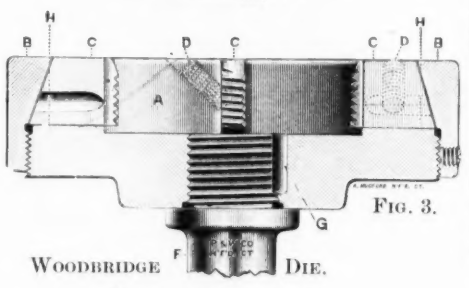


FIG. 3.

WOODBRIDGE DIE.

The Morse Twist Drill and Machine Company exhibit drills and reamers, which are in appearance superior to those shown by their European competitors. The finish of their tools is good, and the proportions look right.

William Sellers & Co. have in operation two of their quick-return—eight to one—planers, which are very closely scrutinized, the operator in charge being constantly called upon to show how closely to the work they will ship. Few are inclined to believe, without ocular demonstration, that the table running back at such velocity can be instantly stopped and the tool dropped in within about a quarter of an inch of the piece being operated upon. This firm also have in their enclosure a tool-grinding machine, a twist drill grinder and injectors.

There are several exhibits of American chucks, and they seemed to hold their own against European competitors.

Here is an item from one of our exchanges. We wonder if it ever occurred to it how silly it is.

A mammoth engine boiler for Mr. Billing's steam mill was drawn through the streets by eight horses on Wednesday.

The Woodbridge Adjustable Solid Die.

An improved form of adjustable solid die for screw cutting has been devised by Mr. J. E. Woodbridge, manager of the small tool department of the Pratt & Whitney Co., which is now being manufactured by that company at the works in Hartford, Conn., in place of the previous form, a cut of which we present on this page, for the purpose of making clear the points of difference between it and the improved die.

In the old die (Fig. 1) the ring by which the cutters were adjusted and held in place was a plain ring of steel, having four grooves milled upon its inner surface at an angle corresponding to the bevel of the outer ends of the cutters, which projected into and fit the grooves. The adjustment was made by means of four small screws passing through the flange of the holder from the back into this ring, two of the screws being arranged to draw the ring down, and thus force the cutters inward, while the other two forced it outward; this opposing action, of course, holding the ring rigidly in place. This die, as our readers know, has become very popular, and very large numbers of them are in use. They have come into quite general use on turret head machines of various kinds for making studs and bolts for locomotive, car and general railroad and other work, and it was this use of them which, as much as anything else, led to their improvement. It was found to be often necessary to remove the die from the turret when adjusting it, owing to the difficulty of getting at the screws. It was also found that the inexperienced men frequently employed upon such machines could succeed in getting the ring drawn down upon one side considerably further than on the other, so that the cutters were not centered in the holder; also that the points of the screws bearing upon the side of the cutters became jammed out of shape at times by abuse, and could not be got at for loosening or tightening the cutters without removing the ring.

The new die is intended to overcome these difficulties. The screws (*D*, Fig. 2) which bear upon the sides of the cutters are put in from the top, and at an angle of 45° with the top surface. The ends of them, where they bear upon the cutters, are flat, and they bear upon the lower side only of the square grooves milled in the sides of the cutters, thus holding them firmly down to the bottom of the slot, as well as to the opposite side. The screws are, by this arrangement, always accessible without removing anything. The ring is made of steel, hardened and ground inside at an angle corresponding to the bevel of the cutters, dispensing with the grooves in the ring entirely. The small screws for adjusting are also dispensed with, and the ring threaded onto the flange instead, so that by loosening the small screw *E* the ring can be turned either way by a spanner-wrench, and every cutter moved precisely alike; after which the screws *E* and *D* are tightened and the die is ready for work. The screw *E* has a small piece of brass under it, which fits into the threads on the flange, and prevents their becoming injured.

Fig. 3 shows the form adapted to cutting threads of fine pitch on comparatively large diameters, such as in threading brass and iron fittings. It is adapted to receive a threaded shank, which may be fitted to any desired machine or fixture.

Experience has proven that, where considerable accuracy and uniformity is desired in screw threads, nothing will do so well as a solid die; open dies springing more or less with variations of size and hardness of stock, and from other causes, which make variations in size of thread, which, though allowable in the case of a large class of work, are not allowable where the best of work is to be done. This has led some manufacturers to the conclusion that nothing is so good for finishing threads to size as the old-fashioned solid square die. Many of those holding this opinion have become convinced by trial, however, that this adjustable die is better, because when in use it is as reliable, and, in fact, is practically a solid die, with the advantage that it can be readily adjusted, and sizes accurately maintained.

Modern Locomotive Construction.

By J. G. A. Meyer.

NINETY-EIGHTH PAPER.

The tension on the springs in the spring balance S (Fig. 546 last paper), the length of safety valve lever, etc., are determined by well-known rules. Before we give these rules, let us first establish a formula from which they may be derived; such a course will give us a clearer conception of these rules.

In Fig. 553 the line $e\,e_2$ represents the center line of the rod marked E in Figs. 546, 551 (last paper). This rod is of course subjected to a tensile stress due to the steam pressure on the safety valve, and this stress is transmitted to the spring balance, hence we may say that the tension on the springs is equal to the stress on the rod whose center line is represented by the line $e\,e_2$ in Fig. 553. The weight of the safety valve lever, weight of valve and weight of vale spindle will of course help to resist the steam pressure on the valve, and will therefore reduce the tension on the springs, and in some cases this reduction in the tension will be considerable. For the sake of simplicity we shall, in the first place, give the rules in which the weight of the safety valve lever, valve and valve spindle are neglected.

Let L represent the distance in inches from the center of the fulcrum to the center line $e\,e_2$; this distance is often called the length of the safety valve lever.

B, the distance in inches from the center of the fulcrum to the center of the valve spindle.

T, the tension in pounds on the springs.

A, the area in square inches of the safety valve; this area must always be taken equal to the cross-sectional area of the safety valve opening D.

P, the pressure of the steam in pounds per square inch of the safety valve area.

W_2, the weight in pounds of the safety valve and its spindle.

W_3, the weight in pounds of the safety valve lever.

C, the distance in inches from the center of fulcrum to the center of gravity G of the lever.

In neglecting the weight of the safety valve lever, valve and spindle, the symbols W_2 W_3 and C, will not be used; we have given them here so as to make our table of symbols complete.

The total steam pressure in pounds on the safety valve is evidently equal to the product obtained by multiplying the steam pressure P per square inch by the area A of the valve; hence the total pressure on the valve is equal to $P \times A$. But this total steam pressure acts with a leverage B, and is resisted by the tension T acting with a leverage L. Now in order to compare the intensity with which the pressure on the valve acts, with the intensity with which the tension acts, we must find the moment of each of these forces.

The moment of the total steam pressure acting on the valve is equal to $P \times A \times B$.

The moment of the tension is equal to $T \times L$.

When the steam pressure on the valve is just sufficient to raise the valve, we have then a condition of equilibrium, in which the moment of the total steam pressure is equal to the moment of the tension, and these conditions are represented by the formula

$$P \times A \times B = T \times L. \qquad (a)$$

Putting this formula in words, we have: The product obtained by multiplying the steam pressure per square inch by the area in square inches, and by the distance from the center of the valve to the center of the fulcrum, is equal to the product obtained by multiplying the tension in pounds by distance from the line of action of the tension to the center of the fulcrum.

From this formula we derive the well-known rules which will enable us to solve any problem relating to the safety valve, and these rules hold true when a weight is substituted for the springs, as in safety valve for stationary boilers; all we need to remember is that the center of the weight will lie in the line $e\,e_2$. We must also bear in mind that, in the following rules, the weight of the safety valve lever, valve and spindle are neglected.

Example 1. The length L (Fig. 553) is 38½ inches; the distance B from the center of the valve to the center of the fulcrum is 3½ inches; the steam pressure P per square inch is 120 pounds; the safety valve is 3 inches diameter. What will be the tension on the springs?

The area A of a safety valve 3 inches diameter is 7.06 square inchees. Here then we have given P, A, B and L; it is required to find T.

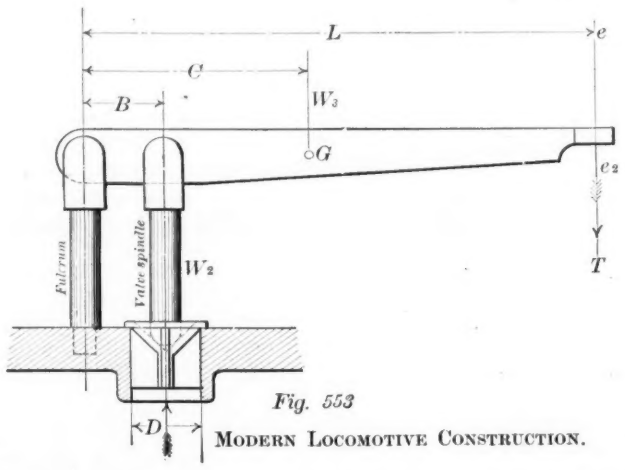


Fig. 553

Modern Locomotive Construction.

We know that

$$P \times A \times B = T \times L,$$

hence, to find T, we have:

$$\frac{P \times A \times B}{L} = T. \qquad (1)$$

Which reads:

Rule 1. The steam pressure in pounds per square inch, multiplied by the area in square inches of the safety valve, and this product again multiplied by the distance in inches from the center of the valve to the center of the fulcrum, and the last product divided by the length of the lever in inches, will give a quotient which is numerically equal to the tension in pounds of the springs.

Substituting the numerical values for the symbols in formula (1) we have

$\frac{120 \times 7.06 \times 3.5}{38.5} = 77$ pounds for the tension of the springs.

Example 2. The tension T is 77 pounds; the distance B (Fig. 553) is 3½ inches; the area A of the valve, 7.06 square inches; steam pressure P, 120 pounds per square inch. Find the length L of the the safety valve lever.

Here we have

$$\frac{P \times A \times B}{T} = L. \qquad (2)$$

Which reads:

Rule 2. The steam pressure in pounds per square inch, multiplied by the area in square inches of the safety valve, and this product again multiplied by the distance in inches from the center of the valve to the center of the fulcrum, and the last product divided by the tension in pounds, will give a quotient, which is numerically equal to the length of the lever in inches.

Substituting the numerical values for the symbols in formula (2), we have

$\frac{120 \times 7.06 \times 3.5}{77} = 38.5$ inches for the length of the safety valve lever.

Example 3. The tension T is 77 pounds; length L of the safety valve lever, 38½ inches; area A of the valve, 7.06 square inches; distance B from the center of the valve to the center of the fulcrum, 3½ inches; find the steam pressure per square inch on the safety valve.

Here we have

$$\frac{T \times L}{A \times B} = P. \qquad (3)$$

Which reads:

Rule 3. The product obtained by multiplying the tension in pounds by the length of the lever in inches, divided by the product obtained by multiplying the area in square inches of the valve by the distance in inches from the center of the valve to the center of the fulcrum, will give a quotient which is numerically equal to the steam per square inch.

Substituting the numerical values for the symbols in formula (3) we have

$\frac{77 \times 38.5}{7.06 \times 3.5} = 119.97$ pounds steam pressure per square inch of the safety valve.

Example 4. The tension T is 77 pounds; length of lever, 38½ inches; steam pressure, 120 pounds; distance from the center of the valve to the center of fulcrum, 3½ inches; find the area of the valve.

Here we have:

$$\frac{T \times L}{P \times B} = A \qquad (4)$$

Which reads:

Rule 4. The product obtained by multiplying the tension in pounds by the length of the safety valve lever, divided by the product obtained by multiplying the steam pressure per square inch by the distance from the center of the valve to the center of the fulcrum, will give a quotient which is numerically equal to the number of square inches in the area of the safety valve. Substituting the numerical values for the symbols in formula (4) we have,

$\frac{77 \times 38.5}{120 \times 3.5} = 7.05$ square inches in the area of the valve.

Example 5. The tension T is 77 pounds; length of lever L, 38½ inches; steam pressure P, 120 pounds; area A, 7.06 square inches; find the distance from the center of the valve to the center of the fulcrum.

Here we have:

$$\frac{T \times L}{P \times A} = B \qquad (5)$$

Which reads:

Rule 5. The product obtained by multiplying the tension in pounds by the length of the lever in inches, divided by the product obtained by multiplying the steam pressure per square inch by the area in square inches of the valve, will give a quotient which is numerically equal to the distance in inches from the center of the valve to the center of the fulcrum.

Substituting the numerical values for the symbols in formula (5) we have

$\frac{77 \times 38.5}{120 \times 7.06} = 3.49$ inches, which is the distance from the center of the valve to the center of the fulcrum.

When the weight of the safety valve, etc., lever are taken into account, the formulas become a little more complicated; but if the foregoing formulas and rules are understood, there will not be any difficulty in forming a clear conception of the rules which we shall give in our next paper.

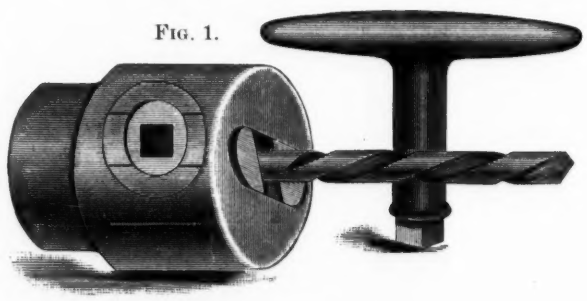
The "Climax" Drill Chuck.

A new drill chuck is illustrated upon this page, in which the aim has been to bring the strain in tightening the jaws directly on a line drawn through the center of each jaw, or, in other words, to avoid all side thrust and cramping caused thereby. In Fig. 1 a general view of the chuck is given, and in Figs. 2 and 3 sectional views showing the construction, similar letters of reference designating the same parts in both figures. A is the body of the chuck through which, at right angles to the hole passing through its center, a round hole is bored, which receives two pieces, C, one of which is in the position shown, and the other on the opposite side of the screw D. These two pieces are held in place by steel pins driven through them and into the body of the chuck. Their inside surfaces are curved to fit the screw, and they are of a width sufficient to embrace about one-half its circumference, being threaded with a V thread to fit a V thread cut upon the square threads of the screw. When the screw is turned to the right by the wrench, it is screwed down into the body of the chuck by this V thread, carrying with it the jaw E. The balance of the circumference of the screw not covered by the pieces C is embraced by the peice B, which passes down, and holds the opposite jaw F. The inner surfaces of the piece B, where it fits the screw, are provided with a square thread which engages with the square thread of the screw, this thread being of just twice the pitch of the V thread, so that, as the screw descends, carrying the jaw E with it, the piece B moves in the opposite direction or upwards at the same rate, and the jaws are thus always centered. At first thought it might be supposed that the accuracy of the chuck would soon be impaired by the unequal wear of the square and V threads, but the fact is that the strain of tightening up the jaws is borne almost entirely by the square thread alone, the V thread serving simply to keep both jaws central in the chuck, the only strain required to do this when tightening the chuck resulting from what excess of friction there may be in the movement of one jaw over the friction of the other, which would practically amount to little or nothing.

Figs. 4 and 5 are views of one of the jaws and the screw, the latter full size.

The interlocking teeth of the jaws are made at such an angle that if a drill slips in the chuck no scoring of the shank results, all parts of its surface being acted upon alike by the jaws. The chuck is manufactured by Clarence M. Kemp, Baltimore, Md.

Fig. 1.



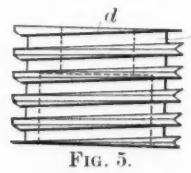


Fig. 5.

Fig. 4.

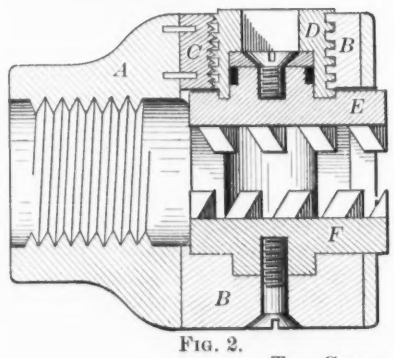


Fig. 2.

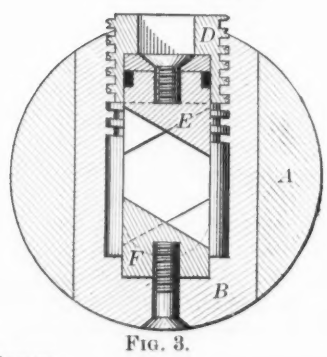


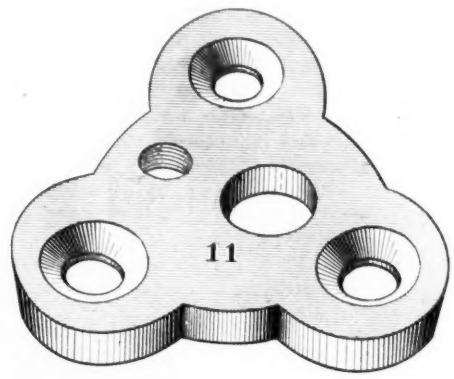
Fig. 3.

The Climax Drill Chuck.

Improved Rapping Plates.

The usual practice in shops having pattern making to do, is to make their own rapping plates for wood patterns, the plates being expensive to make, and of such shape as to require considerable labor in fitting them to the patterns. Mr. Donald Fraser, of Milwaukee, Wis., has placed upon the market a line of rapping plates, including a great variety of styles, three of which are shown by the accompanying cuts. The ones shown, as well as all the others made, are of such shape that all the cutting necessary for fitting them can be done with boring bits, which enables them to be fitted with the least possible labor. This, together with the comparatively low cost at which the plates are furnished, tends to the plentiful use of plates, and the consequent saving of patterns. We believe the plates will be appreciated by pattern makers, who know the trouble and expense involved in repairing patterns which have been broken in the foundry for lack of proper rapping plates.

They are made of malleable iron, and in such a large variety of sizes and styles as to adapt them to all kinds of wood patterns. We know of several prominent manufacturing and engineering concerns, which are using them with entire satisfaction.



RAPPING PLATES.

The *Electrical, Mechanical and Mining News* publishes several alleged pictures of Canadian millers, who recently met in convention in Toronto. If these pictures were accepted as "counterfeit presentments" of the gentlemen they are supposed to represent we should not hesitate to surrender our valuables without controversy to four out of five of them, if they were met outside police protection. But as we happen to know that some, and believe that all of them are good and reputable citizens, we are in extreme doubt as to why our generally fair contemporary has concluded to caricature them. Very likely there is some huge joke connected with the scheme, that is beyond the ken of a Yankee. But we draw the line at one representation that looks for all the world as if it had been copied from one of Nast's efforts at showing some of the propensities of Boss Tweed. There ought to be a certain amount of honor in all things. We hope our contemporary will not be called upon to defend itself in a series of libel suits.

LETTERS FROM PRACTICAL MEN.

Bent Crank-Shafts.

Editor American Machinist:

Since the article on bending of crank-shafts appeared in the AMERICAN MACHINIST of June 27th, the writer has received, through the AMERICAN MACHINIST, a letter from Mr. H. Hendrix, asking for further information, and especially if crank-shafts as large as 8″ really can be bent from the bar as I stated. Mr. Hendrix would go 500 miles to see it done. He would probably have to go a good deal further than this, for it is quite possible that the process is not carried on in America at all; but if Mr. Hendrix will go to England he may see the process of bending at the works of the Grantham Crank and Iron Co., Grantham, Lincolnshire, and also at the works of the Clark Crank Co., in the city of Lincoln, only a few miles away. Whether permission to inspect would be granted cannot be here stated.

Americans are sometimes apt to take airs on themselves, and boast of the freedom with which American works are thrown open to visitors, and contrast the same with the exclusiveness manifested at some English works. It is only works manufacturing specialties that are very exclusive, and seeing that there is no 75 per cent. tariff wall round England a little exclusiveness may be pardoned. The freedom to pick up ideas in another man's shop is not very valuable behind a big tariff.

But to proceed; if Mr. Hendrix will again read the article, he will see that the process particularly described, namely, of bending by a set over a block, was stated as "the method of procedure for moderate sizes," and that where reference was made to 8 inch shafts was after the statement that bending on the same principles may be carried out by hydraulic pressure. Just where the division comes in depends on the tools at hand. For ordinary tap work as described, probably about 5 inches diameter would be a maximum, but with suitably arranged steam hammers giving a heavier blow, there is no reason why considerably greater diameters may not be bent. However, for larger sizes hydraulic power seems best suited, the cranking being done on a specially devised press which forces out the arms and forces inwards the ends of the bar as the throws are being formed. By this system a large bar is bent with fewer heats, and there is less danger of deterioration of the material from overheating or otherwise, and the work has a better finish also. The plant is expensive and only to be afforded by a crank factory. The method for moderate sizes may be attempted by a competent smith with such a rig as he would be able to procure in many workshops, especially if a foundry were at hand to cast a good block.

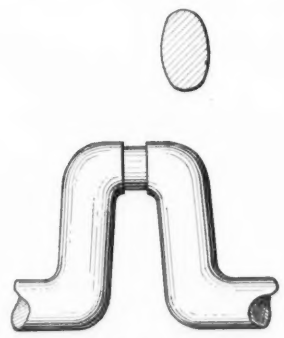


Fig. 1

Fig. 2

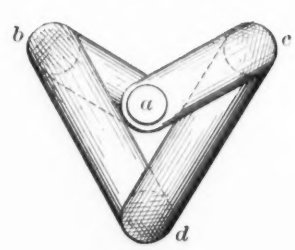


Fig. 3

Fig. 4

BENT CRANK-SHAFTS.

In a crank of the form of Fig. 1 the bend is longer than in the case of a cut out block crank, and in some situations the space is perhaps not available for this extra length. In such cases the arms are made elliptical as shown in the cross-section above, so preserving their full section with increased strength and of less length, whilst losing none of the advantages of continuity. On the Pennsylvania R. R. there is at present an English locomotive running which probably has a single throw cranked axle of the type of Fig. 2. This will probably be about 7 inches diameter At least similar engines built at Crewe Works by the L. and N. W. Ry. Co. have these bent cranks, and may perhaps have been seen there by the American engineers who went to Crewe.

Fig. 3 is an end view of a three-throw crank as made at Grantham, and will show to what a purpose bending is now put. Such cranks are used for pumping machinery.

There is no waste of material in bent cranks with the exception of the small necessary turning up of the bearings. This is very different from a block cranked axle cut out, when a reduction in finishing of over 30 per cent. is not thought excessive. In the matter of finished cost, the bent crank has an immense advantage over the older type, and it is needless to dwell further on the advantages of continuity in the bends. Some men who are adepts at the lathe would find the turning up of the necks and crank-pins of a big three-throw crank like Fig. 3 a matter to tax their skill and accuracy. In this Fig. *a* is the body of the shaft and *b c d* the three cranks.

Since receiving Mr. Hendrix' letter the writer has obtained an illustrated sheet from the makers of bent cranks, and upon this sheet is printed the following:

"Any form of crank bent up to 12 inches diameter, turned and finished, or forgings supplied." This simply proves that in speaking, *within knowledge*, of sizes up to 8 inches, no exaggeration was indulged in, but sizes up to 12 inches were not named, as they were not known to the writer.

Some idea may be gathered of the universal and varied uses to which cranks are put, by a visit to a crank works. Threshing machines, brick machines, looms, engines, pumps and a host of other machines call for bent cranks, but the makers themselves are often puzzled to account for the use to which a cranked bar with four throws at all sorts of angles, and 10 or 15 feet long by 3 to 6 inches diameter, is to be put.

It is curious also in the experience of the crank makers to note the changes in demand for cranks. At one time people will have nothing but steel, at another time iron alone is called for as the material, each metal apparently having its seasons of good and bad repute.

Mr. Hendrix has now the names of two places where it is possible to see bent cranks made not merely of 8 inches, but up to 12 inches diameter. Simple as the operation appears, it requires care, skill and judgment, and a novice would make a weary bungle were he to attempt without experience to bend even a two-throw from a jumped bar. To the eye of a crank smith there is nothing worse than the appearance of a badly bent crank, every corner being flat and wanting that fullness which alone proves the correct judgment to have been first expended on the straight bar.

The process of jumping the swells is of course chiefly applicable to the smaller sizes. Larger sizes, those which are bent from something bigger than a 6-inch *rolled* bar, will require a forged bar, and in forging the bar the bending swells can as readily be forged as not.

In the illustration of June 27th the swell should not, of course, have been shown like a long collar rising suddenly from the body of the shaft, but more of the fashion of Fig. 4 herewith, as it would naturally be if jumped upon a part of the shaft locally heated with the highest heat at what will prove the thickest portion of the swell.

It is possible that for very long cranks the bent form might not be suitable on account of lack of stiffness of the crank arm, but no word of any weakness in this direction has reached the writer.

The diameter of 8″ to 8½″ is a usual maximum, but, as already stated, the Grantham firm make any form of crank up to 12 inches by the bending process, and from a letter dated July 20th, 1889, it appears that the Clarke Crank Co. "have bent three-throw cranks, 13″ in diameter x 30″ stroke," and several such cranks are at work of their manufacture.

W. H. BOOTH.

A Conversation About Making Car Wheels—Verbatim Report.

Editor American Machinist:

Last winter I visited a jobbing foundry in the South, and among other work done was repairs for a railroad. After a pleasant talk with the proprietors, and a walk through the foundry, I noticed a few hand-car wheels in the collection of castings. "I see you make a few hand-car wheels," I said. "Well," responded the genial and good-natured proprietor, "you have expressed it the first time; we make a few, and lose a good many. Just come out in the yard," he says, "and I will show you sadness." A great big heap of tangled and twisted sadness—he had not exaggerated the sadness part; it certainly was there, if about 50 or 100 hubs with crooked, kinked and battered wrought-iron arms, that the rims had been broken from, could give any evidence of hopes deferred. "What is the reason you don't cure that trouble and get sound hubs to your hand-car wheels?" "Well," said my entertainer, "you see there is no such thing as getting those hubs sound; the wrought-iron spokes in them prevents the hot fluid from laying still, and we pour the hub and rim both at the same time, too; we oil, chalk and red paint 'em, but they blow just the same, some worse than others, and these here are a specimen of the worst."

I said, "There is a way I have tried and others have tried, and we remember seeing but very few unsound hubs, if followed. It is not new, but has been used in a few shops north and east, and here is the process:

"In the beginning the hub and rim should

not be poured at the same time; by doing so, the rim shrinks into the arms, and, both ends of arms being rigid, there must be a severe strain on the rim, sufficient to cause it to crack at a very slight blow."

"I have seen a section of rim come right out," said my interested friend.

"Now when you make your pattern you can have attached to the pattern arms a ring, as shown by the dotted line, so made that it will have room to set the gates necessary to run the rim, and these gates for hub marked *A A* and rim *B B*. If you have not many to make, the ring *C* can be cut with a gate cutter, after the pattern is drawn, being careful to cut gates below each print for wrought-iron arms *E E*, etc.; when ramming up cope, you set two sprues for vent *D D*. These sprues answer a very important purpose, and are the *ne plus ultra* of the whole thing in providing means for the steam to escape as fast as made, so that it does not follow up the arm and condense on the end of them where they project into the hub mould; consequently you pour the rim from 15 to 20 minutes before pouring the hub; the latter I have known to be left out until the next day, and was then poured, and came as sound in the hub as a bullet.

"By this method the rim is relieved of strain, your hub is sound, and instead of a great big tangled up heap of sadness, as is now visible, there will be sunshine."

Says my friend: "I see into the whole thing. As fast as steam is made by the metal in the rim it gets into that ricket and *dare* go no further, only up out of the *vent*. Stranger, give me your hand, and we will go over here and talk about the new South and its future, and never say a blamed word about the late war." L. C. Jewett.

The Modern Steam Plant and Its Management.

By Peter H. Bullock.

BE SURE; DO NOT PRESUME.

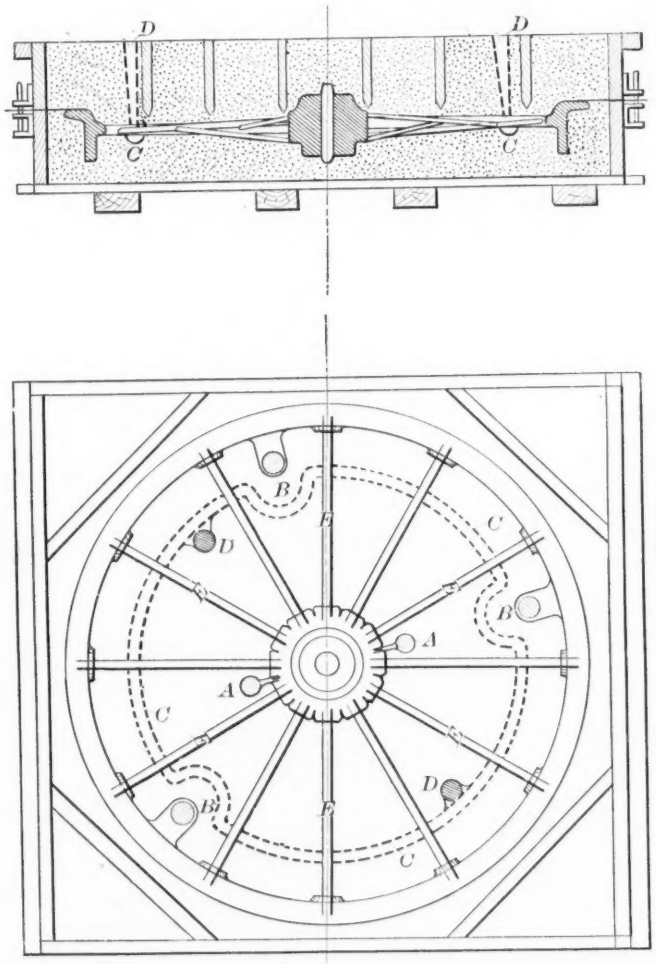
It is quite often that people will use the expression that it is "fair to presume" that such and such a thing is so and so, or that the condition of another thing must be a certain way because it was so at some recent period, or that similar conditions brought certain results in another place. Such reasoning may do for some occupations, but it should have no place in the management of a steam plant, for in this business the only safe way is to base all calculations on established facts.

A very excellent mechanic once "presumed" that the two walls of a building were parallel with each other, when a simple measurement would have shown him that they were not so by several inches. But the measurements were not taken until it was found that two lines of shafting that had been erected on this presumption would not run with each other.

Another time the writer, in laying out a return pipe that it was desirable should have a certain and uniform pitch, presumed that two windows on opposite sides of a building were level with each other, as by rights they should have been, but as in fact they were not by over four inches. This was not discovered until looking for the cause of a disagreeable snapping that the pipes kept up at this point. Had the levels been taken from the hewn base stones all would have been right, as these were level and continuous.

Of course there are cases where it is safe to base ordinary calculations on visible evidence, such, for instance, as where a shaft or pipe passes through a wall or partition, and there is no doubt of its being anything but straight, but beyond cases like these, where something can be seen, it is not safe to presume anything to be a fact that has not been verified.

Some years ago, an engine made by the most noted builder in the United States was erected in a manufacturing establishment, and from the first the crosshead run very badly, no amount of oil or adjustment doing it any good. Knowing ones said the engine was not in line, but it was proved to be so. Others, that the crosshead pin was not at right angles to the piston rod. It was found to be perfectly true, as was also the crank-pin with the main shaft; and the engine ran no better for all this information. Again the piston and rod was taken out, the crosshead and connecting rod taken off, and further tests made. The cylinder was true, smooth and round; the guides were level and in perfect line, and the crankshaft was level and at right angles with the center line of cylinder. The line was about to be taken out in despair, when a person present put a rule across the pin where the line intersected it, and noticed that it was not exactly in the center of the pin. He saw at once that when the connecting rod was on that it would have a tendency to throw the crosshead out of perfect line in the horizontal plane, and cause it to cramp on the guides exactly as it did do. The proper way to fix this would have been to have taken out the shaft and turned enough off from the hub of the crank to let the center of the pin come back to the center line of the engine; but as this could not be easily done, the amount it was out



Making Car Wheels.—See Page 5.

was taken off from the inside end of the pin brasses, and as much put on to the outside end, thus allowing the connecting rod to come into line, and move with both ends in the same plane. It will be seen that in turning the engine for squaring it, that if the measurements were all taken from the front or all from the back side they would show all right, and it was only by accident that the 1-16th of an inch that the line was out from the center was noticed. Of course this error belonged to the shop, as no possible amount of adjustments of parts could have brought the shaft back into its proper place. Honors are, however, usually about even between the shop and the men that set up the products of it, so far as mistakes go. I have done my share of "cussing" the "idiots" in the shop for sending out work not properly fitted, and have had to admit that I was in danger of the fool-killer myself, when the fault was my own in getting things wrong.

Whenever it becomes necessary to take an engine, pump or other piece of machinery apart to discover any suspected fault, do not give up until it is found. This is brought to my mind by the ownership of a $1,000 cold chisel. Not that this rather poor chisel is worth that amount of money now, or that it ever had an intrinsic value of that amount. Still it has cost an engine owner that amount of money in an indirect manner, from the fact that it got into a position where it materially interrupted the flow of steam from an engine for fully two years. During this time the steam-chest cover had been taken off probably a dozen times to see what made the engine exhaust so hoarsely when running up to speed. No engine ever suffered from more outrageous valve setting than had this one. Set screw scores on the shaft showed that the eccentric had at different times occupied every available position for 90° each side of where it belonged. It had been set by theory, by practice, by steam, by guess and by numerous —— methods, and always, when run up to speed, it would sneeze and lag in a most alarming manner. Several had hinted that some of the steam passages must be stopped up, but as they looked all right, and a wire could be pushed through, no one had insisted on proving it to be all right by making any simple test. Everybody had been willing to *presume* or to *assume* that it was all right, because it appeared to be so, while, in fact, 70 per cent. of the exhaust passage on one end was stopped by the chisel to which I have referred. Now this was not on the shop, for the chisel belonged to the engineer, and was, no doubt, lost there by him in one of his Sunday or holiday explorations, as he had a penchant for pulling things to pieces, if they run well, to see what made them do so, and, if they did not run well, to try and find out why not. The result to the apparatus, when a fellow of this kind is around, is usually rather bad, for if a man don't know enough to let things alone when they are all right, he won't know enough to fix them when they are wrong.

This champion high-cost chisel was extracted from its lodging place by drilling a 1¼" hole through the wall of the steam-chest, and the engine has since shown no signs of bronchial trouble. The means employed to discover the fault were a little agricultural, but we got there. A funnel was made to just fit the exhaust ports, and the time it took for 20 pounds of hayseed to pass through each port was carefully noted. The time being more than four times as long on one end as on the other led to the discovery of the chisel, which completely knocked out the diagnosis of several who had advanced some novel suggestions founded on assumed data—the chisel was the fact.

In the manufacture of tinfoil, tin is melted and run into blocks weighing from 200 lbs. to 400 lbs. each; and in this form the metal is kept for ordinary use. The old method for reducing it to the necessary thinness for foil was by hammering it by hand as the gold-beaters do gold leaf, and this process is still in vogue to a limited extent. This, however, is a very laborious process, as the sheet must be constantly beaten without intermission, to keep up the heat generated by the continuous strokes of the hammer, and the great drawback to it was that only one surface or face could be produced. The introduction of rolling machinery has completely revolutionized the trade, so that in place of importing we now export. In these mills the metal is given a beautiful polish on both sides; it is then cut into widths of from 12 in. to 15 in., rolled on reels, and cut to order by cutting machines. The great advantage of the machine-rolled foil over the hand-beaten foil is that while the latter is full of minute holes, so small as not to be visible to the naked eye, the former is, as a rule, perfectly intact, and thus, being air-tight, forms a wrapper that cannot be equaled by any other substance.—*The Engineer* (London).

A paper on "Erosions due to Wind Action" was read at a recent meeting of the Paris Academy of Sciences by M. Contejean. During a recent visit to Corinth, the author observed a remarkable instance of this phenomenon on the neighboring plateau, where an old amphitheater some fifteen meters from the edge of the escarpment communicates with the beach through a cavern with wide openings at both ends, and above which the limestone rock forms a natural bridge. The walls of this cavern, which is formed in the sandstone stratum at the foot of the cliff, are extremely rugged and irregularly corroded, nowhere showing traces of human workmanship. The tunnel could not possibly have been excavated either by the rains or the running waters, and its existence can be explained only by the action of the sands playing on a point of least resistance under the influence of the fierce northern gales prevalent in this region.

Herr Bickmann has patented in Germany a process for enabling sulphuric acid for manufacturing purposes to be safely transported. He takes advantage of a property of certain salts—of which alkaline sulphates are representatives—by which they give up their water of crystallization when heated and take it up again when cool; and he does so by mixing the salts in an anhydrous condition with a calculated quantity of sulphuric acid. The whole mass becomes granular, or may be formed into cakes, and when heated the whole liquefies and may be used as if it were sulphuric acid, for the presence of bisulphate of soda does no harm.

Little Ike—Uncle Rastus, does cold make ebything git little?

Uncle Rastus—Yas, it do; cold will always contrac'; don't you 'member night fo' last Christmas de wood pile o' Parson Jones dat libs next to me swonk up in one night t' nex't nothin'?

Little Ike—But don't you 'member, Uncle Rastus, how de pile o' wood by de side o' de stove in the cabin got heap bigger?

Uncle Rastus—Well, 'twas hot in de room you little idyot; heat makes things biggar You ain't got de sense you was born wid —*Harper's Bazar.*

A Haverhill (Mass.) dispatch says: "Alfred Briggs, a cutter at W. F. & J. A. Blake's shoe manufactory, fell down an elevator well Friday evening, and was severely injured." What is the matter with having elevator wells so guarded that no one can fall down them? It don't cost much.

Just at this time there is a fight among the members of the Sugar Trust. When rogues fall out honest men get their dues. This is an old saying, and there is lots of truth in it.

Bolt-Heading Machine.

The Acme Machinery Co., of Cleveland, Ohio, have recently perfected a machine for heading bolts, and for making many other forgings from the end of rods, which we illustrate by a general perspective and detail views on this page. Especial care has been taken in the designing of the machine, to so construct it as to reduce the violence of the heavy shocks incident to such work, and make the machine amply strong enough to withstand them; also to so construct it that not only the least possible wear shall take place, but that repairs made necessary by such wear as does take place shall be easily made, without the necessity for entirely dismantling the machine and taking it to the machine shop.

To this end, no part subject to wear slides directly upon the bed of the machine, but always upon pieces which may readily be removed to be trued up or replaced. The vertical cross-section, Fig. 2, shows the arrangement where the heading slide *T* has attached to its lower surface two strips of hardened and ground tool steel *A A*, which are 2½″ wide and 30″ long, these resting and sliding upon similar strips attached to the bed. At each side are cast gib pieces *E E*. This system is carried out all through the machine, as is shown by the various sectional views.

Side shafts have been dispensed with, and the movable die block (*M*, Fig. 3,) is moved up to close the dies, by the action of the sliding piece *U*, different views of which appear, designated by the same letters in all the sections. The block *O*, to which the toggle levers are attached, rests upon the inclined surface *V*, Fig. 4, so that, when the slide *U* advances, the block *O* is forced upwards, and, by means of the toggles, moves the block *M* to the right, closing the dies. The sliding piece *U*, as well as the heading slide, is actuated from the main shaft, which is of the best hammered iron. The blocks *O* and *M* are returned to their normal position by a rocker arm provided with a roll at its rear end, which comes in contact with a return incline, *W*, Fig. 4.

As will be seen by the general view, and the section, Fig. 2, the frame consists of three trusses running straight through from front to back, an extension of the outer ones forming the base upon which the machine rests.

The toggle levers *N N* are of tool steel with spherical ends 2½″, having a bearing in solid metal, besides being held in place by steel pins 1¼″ diameter.

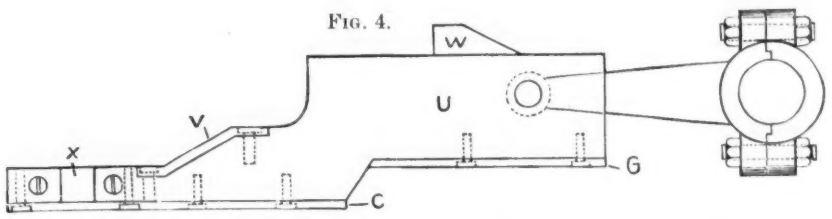
The dies and punches are of novel construction, and designed to turn out perfect work with the fewest possible strokes. Track bolts, plow bolts, rivets and many other forgings are cut from the rod, by a shear provided in the rear of the dies.

The machine is also provided with effective and simple outside shears, which can be used for cutting up stock or for cutting off work from the bar after forging. Back of stationary toggle block is placed a relief wedge, which can be adjusted to sustain any required pressure, and which will yield to any unusual strain or shock, giving an elastic blow to the forging dies, and also preventing any breakage of machine or parts by a careless operator allowing cold work to get between the dies or out of the grooves. The same system is used in connection with the heading punches, and is placed on the heading slide in rear of tools.

Stationary die block, movable die block, toggle arms and toggle blocks are all steel, and the entire construction of the machine is such as is thought will best adapt it to its work.

The stock gauge is also a new and valuable feature, remaining in front of the dies until they are entirely closed, and then moving out of the line of the heading tools, with a smooth and easy motion, in less than 1-30th of a revolution of the machine. The illustration is from the 1¼″ standard machine.

FIG. 4.



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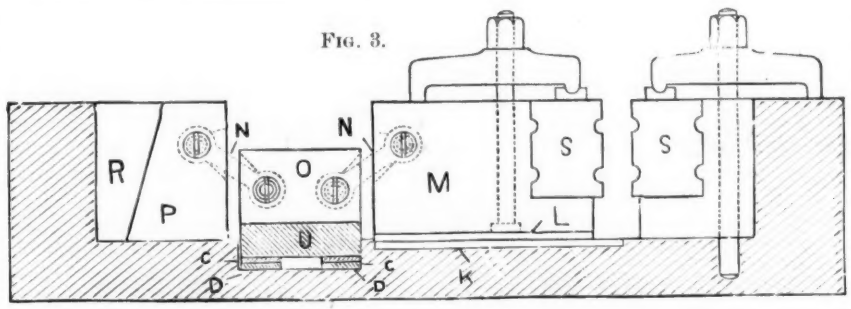


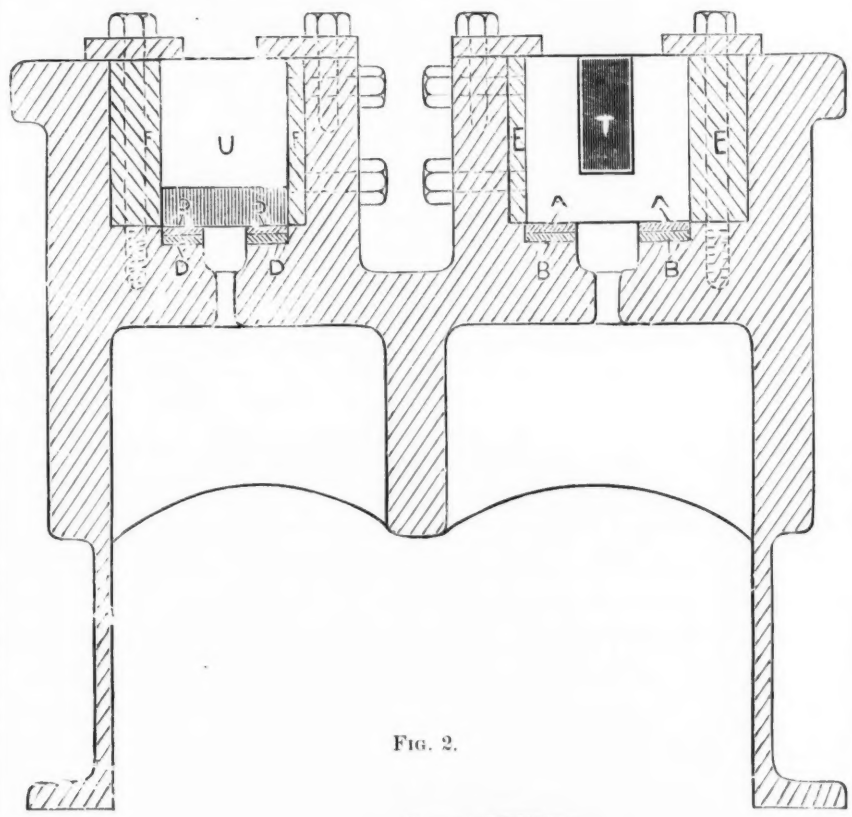
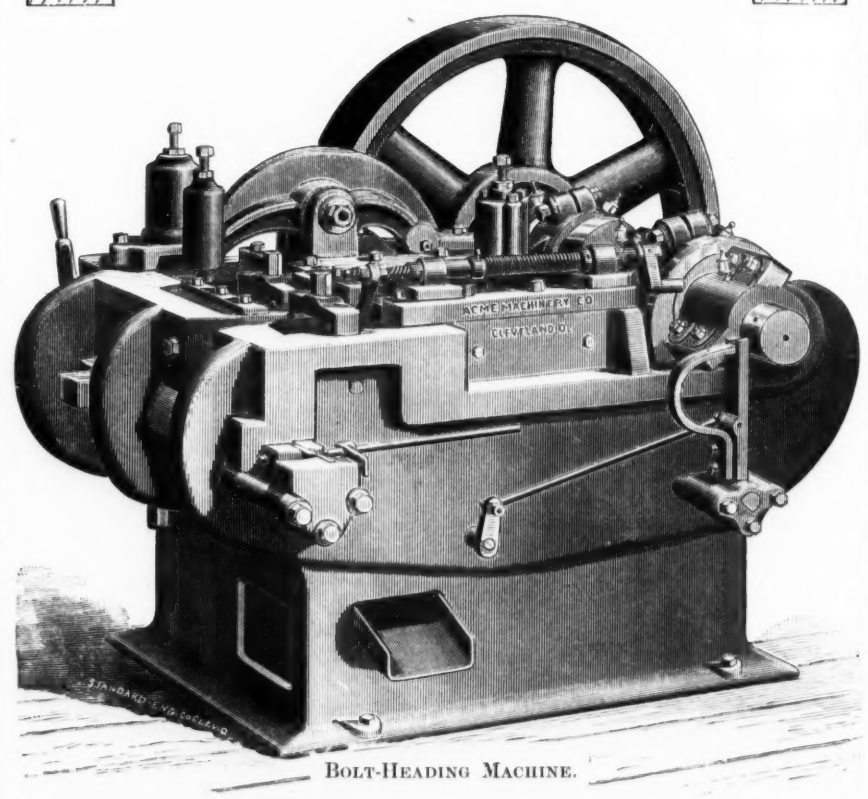


FIG. 2.



BOLT-HEADING MACHINE.

E. P. Bullard, 72 Warren street, New York, was recently damaged slightly by fire, but he writes us that his business is not particularly interfered with, and that he is ready to meet customers as usual.

Novel questions frequently arise relating to the imposition of duties on imported products, but probably nothing more novel was ever suggested than the query as to the liability of imported electricity to a tariff duty, which is now under consideration. An electric light company, which has its plant on the Canadian side of the boundary line, proposes to supply electricity for lighting Niagara Falls village and its surroundings. But can electricity and electric light, manufactured in a foreign country and made merchantable commodities, be admitted into the United States free of duty? They are certainly not down on any schedule or classification of the tariff, and the question is in what class can they be placed. If reference is had to the use which New York proposes to make of electricity, to give a murderer his final quietus, perhaps it could be put on the tariff schedule of "deadly weapons."—Jersey City *Evening Journal*.

A good many occurrences during the past few years go to show that the commanders of naval vessels are not born pilots. The last occurrence is knocking a hole in the Boston after her quite successful trial trip. There is a good deal of nonsense in the insisting by the government that a vessel belonging to the navy shall not make use of a pilot over ground which her commander had, perhaps, never traversed, and at the same time insisting that the captain of a steamship shall not take his vessel into a port to which he has sailed a hundred times. Somehow or other the two things do not square.

Boston, besides the other things for which she is noted, seems likely to become famous as the birthplace, or at least the nursery of remarkable, startling and revolutionary inventions. Several times recently we have had occasion to speak of some of the astonishing and original ideas emanating from that quarter. First we had the man who had upset all the known laws of friction, by making a driving wheel for a locomotive with numerous flat places on the face of the tire. Then next, according to the published reports, a man had invented a cold storage arrangement for steam, which seemed to work not in accordance with any of the old and well-known principles supposed to govern such matters, but according to new principles especially discovered and promulgated for the occasion. Now we have a scheme for an air ship, which is to be of steel, with the air exhausted from the inside. This of itself is not a new idea, but the principle upon which it works, instead of being the old one according to which the lifting power of such an arrangement is about equal to the weight of an equal bulk of air, less its own weight, is a brand new one, involving the discovery of a new property of the atmosphere, to which the inventor has applied the euphonious title of "anthexis." Hear him: "Anthex is provides sustentation for the air ship by automatic means, independent of power, indestructible in their nature, and so perfectly adapted as to make its fall a physical impossibility." We wonder that this new genius does not leave the air inside of his steel vessel, and depend upon anthexis entirely. When the air is exhausted there will be of course a pressure of something like fifteen pounds to the square inch upon it, and it will of course have to resist this by being made correspondingly strong, whereas, if the air were left in it, it might be made of tin, and its cost considerably reduced. According to the information given us regarding it, anthexis would sustain the affair, even if it were filled with lead.

The Western Union telegraph manager at Worcester says that 40,500 printed forms for messages are used at that office every three months. With so many of those blanks used it is a wonder that somebody doesn't make howling enough to get a new and proper blank supplied, on which there shall be room enough for the place and date to be written. The blank now used is a public nuisance.—*Lowell Weekly Journal*.

Well, that is a fact; the little picayunish blanks that the Western Union supplies are a nuisance, and no mistake. We once read of the man who confidentially told the saloon keeper how he could sell more lager, viz., by providing larger glasses. Perhaps the Western Union would do more business if it provided larger blanks.

Horace See, who for twenty years has been connected with the Cramp Shipbuilding Company and twelve years its superintendent, will sever his connection with the firm in September. After a trip abroad he will settle down in this city. It was under his direction that the dynamite gun cruiser Vesuvius, the yacht Atalanta, the steamboat Monmouth, and other famous vessels were constructed —New York *Evening Sun*.

Nearly every one of our exchanges, we see, has an account of some dam giving way. This emphasizes what we have heretofore said, viz., look out for the dams. The majority of the dams in this country are not built by civil engineers, but are built by guess, by an interloper. Look out for them.

The Daily Hot Blast says Decatur [Ala.] is in need of skilled mechanics.

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FRED J. MILLER, }

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NEW YORK, AUGUST 22, 1889.

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"The Pursuit of Knowledge Under Difficulties."

The Engineer (London), under the above heading, and referring to the fact that some fifty American mechanics are making a brief tour of Europe to note what they can see of interest there, vents its spleen in a manner that really looks, or reads, ridiculous. It assumes that these fifty Americans are thirsting after knowledge that is presumably penned up between British brick and mortar, and goes as far as possible in promising that they shall not see the inside of manufactories. The conclusion of our contemporary's effort is particularly splenetic, and pathetic as well. Here it is:

Can we afford to wear our hearts upon our sleeves "for daws to peck at"? The Midland manufacturers, if the lesson of former years is borne in mind, are certain to present difficulties to the small army of observation now crossing the Atlantic to "take a general view of the industrial situation." It requires no prophet to foresee that, whether it is "general" or not, an "outside view" will in most instances have to content the fifty and their friends who thirst for the information of other people.

How much easier, after all, it would have been to have issued an edict forbidding these fifty men, bent upon destroying the supremacy of British manufacture, to land on British soil. They may, even from an "outside view," contrive to carry away a good many photographs of chimneys and other accessories of manufacturing establishments, to the great detriment of British trade. But we predict that *The Engineer* is hardly voicing the sentiment of British manufacturers. British engineers and mechanics frequently visit this country, and we believe that a good deal of pains is sometimes taken to show them such things as we have to show in the way of manufacture, and it is more than likely that there will be a return of favors. Sometimes English engineers and mechanics have found things here that were useful to them, but there was just as much knowledge left after their departure. And even if these fifty American mechanics are permitted an occasional inside view of British manufactories there will be left a good deal of knowledge after their brief pilgrimage is over. We can promise our alarmed contemporary that they will leave a good deal of manufacturing to be done on British soil, even after they get back to America. We really, however, should not advise the wearing of one's heart on his sleeve; there is a better place for it.

Government Telegraph Rates.

Great interest is naturally taken in the contest now going on between the head of our Post Office department and the president of the Western Union Telegraph Co., regarding the proper rates to be charged for government messages, and the contest is made all the more interesting, since the advantage seems to fluctuate from one to the other of the contestants, the one who has written the last letter seeming to have the best of his opponent.

The sympathy of the people will naturally be with the Postmaster General in his contest with a corporate monopoly, which seems to pay little regard to the wishes or rights of the people. But it is to be remembered that even monopolistic corporations have rights which should be respected, and whatever is done should be strictly fair and just, and the people should be satisfied to have the authorities deal with this matter in a manner which will bear the strictest tests of fairness and justice.

It seems, however, to be pretty well established, that the telegraph companies have received valuable franchises and privileges from the government for which they have made no return, and for which even the free transmission of Government messages would be only a partial recompense. If this be true, as at this writing it appears to be, and the company can justly be made to pay for its privileges in part, by all means let it be done. But there is another feature of the case which seems to be escaping attention, *i. e.*, that the Western Union has things in such shape that it can charge for ordinary telegrams whatever rates it chooses to charge, and if Dr. Green should conclude to levy upon the people for the losses sustained upon Government messages, who is to prevent him?

A new force in war has come to the front. It is no less than the base ball pitcher. Heretofore this expert has been chiefly noted for the trouble he gave opposing batters by his undefinable curves and twists. He has also been noted for the velocity of his delivery, and for sundry and diverse peculiar antics previous to his shooting a ball (like a catapult) towards the home plate—we believe that is the proper name. But if we believe recent accounts, he has distinguished himself by being the prime mover in putting down rebellion in the Sandwich Islands. A band of insurgents refused to be dislodged by the king's artillery. In fact they derided the efforts to dispossess them of the building in which they had taken up quarters. Under these circumstances it was determined to treat them to dynamite bombs, but there was no means at hand for properly distributing these death-dealing missiles where they would do the most good. Finally a bright idea struck some one. There is a base ball nine at Honolulu, and why not utilize the pitcher? That was what was done, and after he had curved three of these bombs around obstructing obstacles, and landed them—with the usual mortuary conditions—in the camp of the insurgents, like Scott's coon they "came down." All this is on the authority of a "passenger," who is probably quite as good authority as the "intelligent contraband" used to be. At any rate it is a good story, and ought to be true.

The resolutions adopted by the National Electric Light Association at their recent meeting in Buffalo, with the comments thereon by the newspapers, are somewhat amusing. It is noteworthy that the association fails to put itself on record in these resolutions as doubting the efficiency of an electric current for executions of criminals, the only reasons given for their opposition to its use being that "the law requiring the execution of criminals by electricity . . . was enacted under a misrepresentation of its philanthropic importance or value," and that the association "regards such a law as an unnecessary degradation of the most useful natural agent that science has ever rendered available for the service of man." All of which is pure sentiment, and also pure nonsense.

As a fair sample of the arguments brought forward against the use of electricity in executions, we may mention the numerous accounts of men who have accidentally received severe shocks from which they recovered. Great stress is laid upon what they say as to the severe torture suffered by them, and from this it is argued that electrical executions will be extremely cruel instead of mercifully painless, as they were intended to be—an argument which is about equivalent to declaring that one who is instantly beheaded by a guillotine or a cannon shot suffers more than if broken on a wheel, flayed alive, or subjected to any other form of slow torture.

If stationary engineers were not made of discriminating stuff they would be puzzled by the "instructions" that are given them by those who set themselves up as instructors. For example, under "Hints to Running Engineers" in a recent issue of a trade journal, is the following: Cut off so that the terminal [pressure] will just run to the vacuum line in non-condensing engines. Just where it would be necessary to cut off in a non-condensing engine to bring about this condition is not stated.

Literary Notes.

Root & Tinker, the enterprising publishers of a weekly journal devoted to the dry goods trade, have begun the publication of a daily in the same line of business, the title being the *Daily Dry Goods Reporter*. The publishers are pushing men, and the dry goods trade is large enough to support a daily. The *Reporter* looks well, reads well, and we predict that the venture—it is a large one—will be a success. We also hope it will.

QUESTIONS AND ANSWERS

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(314) A. B., Boston, Mass., will find directions for measuring the horse-power of an engine from indicator diagrams in the AMERICAN MACHINIST of Feb. 16, 1884.

(315) G. L. S., Otego, N. Y., asks: Where can I obtain circular saws for cutting metal? *A.*—Brown & Sharpe Mfg. Co. make small ones; for large circular saws, write to any manufacturer of saws. 2. Can you put me in the way of obtaining a patent on a machine which I have made, and about how much will it cost? *A.*—Place your invention in the hands of a patent lawyer of acknowledged ability and honesty; he will transact all the business connected with obtaining the patent. The cost will depend on the amount of labor required for the drawings and specifications. The least charge will be about 65 dollars.

(316) W. S., Pittsburgh, Pa., writes: Will you please inform me what difference a short and long arm rocker makes in a locomotive? Say, for instance, the upper arm of the rocker is ten inches, and the lower one is eight inches. Does it increase the power of the engine? *A.*—The reason for making one arm longer than the other, is simply to obtain the correct travel of the valve after the throw of the eccentric has been established. In determining the length of the rocker arms, no attention is paid to the power of the engine; yet, if the rocker is not properly designed, the power of the engine will be affected as any badly designed valve gear would affect it.

(317) "Reader," ———, asks: Can you or any of your readers tell me how I can plane the **V**s of a lathe or planer without making a template, or if not, what is the best form of template to use? *A.*—If, as we infer from your letter, you are not regularly engaged in building tools, but wish only to do an occasional job of this kind, you had best make a pair of templates out of thin sheet steel, fitting them to each other, and then planing the work to them. Those for the planer should be so made as to fit both **V**s, and for the lathe it is best to make two pairs, one for the outside **V**s and carriage, the other for the inside **V**s and for the head and footstock.

(318) C. E., Carlisle, Ind., asks: Can rocking grate bars be worked successfully for any length of time in a single furnace with a brick bridge wall? *A.*—Yes. 2. We have a smoke-stack about fifty feet high, that does not give draft enough to burn slack; this stack is to be replaced. Will a higher one give more draft? *A.*—Yes. 3 How much higher should the new stack be? *A.*—Impossible to answer; you have not given us any data from which we can make the necessary calculations. 4. Is there any book which will enable me to become a good mechanical draftsman? *A.*—We believe that the articles on "Practical Drawing," now running in the AMERICAN MACHINIST, will aid you in your desire.

(319) T. M. R., Anderson, Ind., writes: It is required to build two rolls, between which veneer 1-26 of an inch is made to pass; during one revolution of the rolls they must draw in 27 inches of veneer. What must be the diameter of the rolls? *A.*—If there is no slip, the circumference of each roller must be exactly 27 inches. The diameter is found by dividing 27 inches by 3.1416; the quotient will be the required diameter, thus: $\frac{27}{3.1416} = 8.59+$ inches. If there is slip, you can make allowance for the same in the following manner: For the sake of illustration, assume that the rolls draw in 26 inches instead of 27 inches. Here, then, it is evident that the circumference of the rolls must be increased, to enable them to draw in 1-26th more than they have done. Now, 1-26th of 27 inches is $1\text{-}26 \times 27 = 1.04$ inch very nearly; hence, the total circumference of the rolls must be $27 + 1.04 = 28.04$ inches. Find the diameter of a circle whose circumference is 28.04 inches by the rule given; the diameter thus found will be the diameter of the rolls. In a similar manner you can make allowance for any other amount of slip.

(320) B. T., Denver, Col., asks: Can you give the weight, maker's name, and whereabouts of the heaviest locomotive in the world? *A.*—We believe that the heaviest locomotive was built at the Baldwin Locomotive Works, Philadelphia, Pa., for the Northern Pacific Railroad Co. Gauge, 4 feet 8½ inches; actual weight in working order, exclusive of tender, 150,000 pounds; actual weight on driving wheels, 135,000 pounds; estimated weight of tender, including coal and water, 75,000 pounds; estimated weight of locomotive and tender in working order, 225,000 pounds. Cylinders, 22x28 inches; driving wheels, four pair coupled, 50 inches; total wheel base,

22 feet 3 inches; driving wheel base, 14 feet; total wheel base of engine and tender, 49 feet; boiler of steel, 5/8 inch thick, 72 inches diameter; height of center line of boiler above rails, 7 feet 8 inches; fire-box, 10 feet 1 inch long, by 42⅝ inches wide inside; tubes, 271 in number, 2¼ inches diameter, 13 feet 6 inches long. Heating surface of fire-box, 172 square feet; heating surface of tubes, 2,121 square feet; total heating surface, 2,393 square feet; tank capacity, 3,600 gallons. These engines are used on grades of 116 feet, and curves of 10 degrees. At some points of the grade there are reverse curves. The largest load yet hauled by one of these engines was twenty loaded cars, equal to about 600 tons (2,000 pounds per ton). Probably under favorable conditions the average load of these engines will be about eighteen loaded cars, and for winter the average load will not be over sixteen.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday for the ensuing week's issue.

Gear wheels and g-cutting. Grant, see adv., p. 16.

Link-Belting and Sprocket Wheels.
Send for Catalogue of Link-Belting.
Over 50,000,000 feet of Link-Belt in use.
Link-Belt Engineering Co., Philadelphia and N. Y.

25″ Upright Drills. J. E. Snyder, Worcester, Mass.
28″ Upright Drills. J. E. Snyder, Worcester, Mass.
32″ Upright Drills. J. E. Snyder, Worcester, Mass.
36″ Upright Drills. J. E. Snyder, Worcester, Mass.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Worcester (Mass.) Polytechnic Inst. See advt.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Drop Presses, Punches and Shears. Williams, White & Co., Moline, Ill., manufacturers.

R. Dudgeon, 24 Columbia st., New York. Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton & Dutch sts., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

The best Upright Hammers run by belt are made by Jenkins & Lingle, Bellefonte, Pa.

Ice and Refrigerating Machines, 131 sold, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

See S. W. Card & Co.'s (Mansfield, Mass.) Catalogue of Screw Plates for Gunsmiths and Amateurs.

"How to Keep Boilers Clean." A 96-page book mailed free by Jas. E. Hotchkiss, 120 Liberty st., N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Best silk wiping towels for machinery in the market. S. A Smith, 23 S. Canal st., Chicago, Ill.

Iron Planers from 16″ to 36″ wide by any length. H. C. Pease & Co., Worcester, Mass.

R. G. Du Bois, 715 11th St., Washington, D. C. Procures first class patents on inventions. Write.

For the latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson st., Chicago, Ill.

Send $1 for Catalogue D, Fine Tools and Supplies. Over 550 pages. Fully illust'd. Free when $10 worth goods are ordered. Frasse & Co., 92 Park Row, N. Y

Curtis Pressure Regulators. Curtis Return Trap. Curtis Damper Regulator. See July 25, p. 10. Send for circular No 17. Curtis Reg. Co., Boston, Mass.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

For Portable Key-seating Machines and Stub Ends for small connections, address T. C. Dill Machine Co., 726 Girard ave., Philadelphia, Pa.

The best emery wheel made is the "Norwich." For particulars send to Montgomery & Co., 105 Fulton st., New York.

Rubber Belting, all sizes, 77½ per cent. from regular list. All kinds of Rubber Goods at low prices. John W. Buckley, 156 South street, New York.

The Holly Manufacturing Company, of Lockport, N. Y., will send, on application, their pamphlet illustrating pumping machinery and reports of duty trials.

W. H. Hoffman, consulting engineer, 108 Liberty st., room 3, N. Y. Mechanical engineering in all its branches, working drawings for the transmission of power by steam, water, air and electricity.

Steam Boilers: Their management and working on land and sea. By Jas. Peattie Practical facts from 30 years' experience. 230 pages illustrated, 12mo., cloth, $2. Circulars and Catalogue of Books for engineers free. E. & F. N. Spon, 12 Cortlandt st., N. Y.

For foundry or general manufacturing, a compact property in heart of Buffalo, N. Y. 98x380 ft., on two streets, near canal and R. R. Steam heated brick building ⅙ size of lot, four light, clear floors, two elevators, outside stairs, engine, boiler, main shafting, wagon scales, stables, abundant yard room. For sale cheap. Address M. H., 56 Pearl St., Buffalo.

H. B. Roelker, 22 Cortlandt st., New York, late Sup't Delamater Iron Works, will hereafter manufacture the Delamater Screw Propeller.
Propellers of same pattern and workmanship as formerly made by the Delamater Iron Works. Each designed for its special work at lowest prices.
Consulting Expert and Constructing Engineer.
Estimates made on machinery and on damages.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price $2, postpaid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the American Machinist. Two styles, the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Pub'g Co., 96 Fulton st., New York.

"Practical Drawing." By J. G. A. Meyer. The above series of articles, now running in the American Machinist, should be closely followed by every student. They commenced with October 23, 1886 issue, and up to and including July 18, 1889 issue, 81 articles have been so far published. Copies containing these articles sent by mail to any part of this country or Canada at 5 cents each. American Machinist Publishing Co., 96 Fulton st., New York.

"Modern Locomotive Construction." By J. G. A. Meyer. The above series of articles, now running in the American Machinist, are attracting the attention of railway mechanics all over the world. Commencing with the June 27, 1885 issue, 96 articles have thus far appeared up to and including the July 25, 1889 issue. Copies containing these articles sent by mail to any part of the U. S. or Canada, at 5 cents each. American Machinist Publishing Co., 96 Fulton st , New York.

MANUFACTURES

The Rockford (Ill.) Electric Manufacturing Co. has been incorporated.

It is reported that the Cabot Company will build new cotton mills at Brunswick, Me.

The Sterling Wrench Company contemplate moving from Sterling to Akron, Ohio, and increasing their capacity.

A company with a capital of $30,000 has been organized in Hastings, Mich., to manufacture the Walter L. Wilkins refrigerator.

M. A. Lapham is building a brick addition to his woolen mill, at Millbury, Mass., 50x36 feet, two stories high on one side and three on the other.

The Sioux City (Ia.) Foundry and Machine Works, with a capital stock of $100,000, has filed articles of incorporation in the State Secretary's office.

The Fort Wayne (Ind.) Electric Company, with a capital of $3,000,000, has been organized for the purpose of manufacturing electric appliances.

W. R. K. Sanford is endeavoring to organize a stock company at Selma, Ala., for the purpose of manufacturing steam boilers, vaults, tanks, etc.

The Northwestern Indiana Millers' Association recently met at Wabash, Ind., and took steps to bring every miller in its jurisdiction into a "trust."

The Topeka Sugar Works, at Topeka, Kan., the largest in the State, were almost totally destroyed by fire recently; loss estimated at $70,000, insurance $40,000.

The Birmingham (Ala.) Rotary Motor Company, capital stock $100,000, has been chartered to manufacture engines under the patents of Herman Knebel.

N. B. Cushing's machine shops on Hudson street, between Sussex and Morris streets, Jersey City, N. J., which were recently destroyed by fire, are being rebuilt.

Stock in the Fort Worth (Texas) Stove Foundry is about all taken, and the contract for the works in the Avondale addition will be completed about November 15, 1889.

The Anniston (Ala.) Loan and Trust Company has been organized, with a capital of $100,000, all paid in. O. H. Parker, president; J. H. Noble, secretary and treasurer.

M. Mahony, Troy, N. Y., sends us an illustrated catalogue of the Mahony boiler for steam or hot water heating. It is well got up, and will interest those who may see it.

The West Point (Va.) Fertilizer Co. has been incorporated, with Morgan Treat president, and E. Wilkinson vice-president, to manufacture fertilizers from Pamunky marl.

The W. M. Simons Electric Company has been formed at Plymouth, Ind.; capital stock, $25,000; incorporators, Milliard W. Simons, Perry A. Randall, Orlando M. Packard, Albertus Caprin and R. T. McDonald.

At the directors' meeting of the Consolidated Car Heating Co., held at Albany, N. Y., recently, D. D. Sewall was elected general manager; J. H. Sewall, assistant general manager, and J. F. McElroy, mechanical superintendent.

The Michigan Whip Company has been organized at Hastings, Mich., to engage in the manufacture of whips. Henry C. Maentz, of Allegan, will serve the corporation in the capacity of secretary. Business will be begun about November 1.

According to a catalogue issued by Hill, Clarke & Co., Boston, Mass., the tools and machinery of the Hinckly Locomotive Works, of Boston, will be sold at auction on Aug. 21. In the meantime private sale of the machines will be made by Hill, Clarke & Co.

The Planters' Oil and Ice Company has been organized at Macon, Ga., with a capital of $100,000. This is a consolidation of the Cotton Seed Oil Company and the Ice Company. They will build new works at a point convenient for all the railroads.

A shoe manufacturing concern has been formed at Eastport, Me., with a capital stock of $50,000. It is expected that the skating rink building, located in the center of the town, will be used for the factory. It is proposed to start with 75 hands, and make men's goods.

It is reported that Dr. J. O. Bronson, projector of the Alabama, Florida & Atlantic Railroad, graded from near Eustis to within a few miles of Altamonte, has sold it to an English syndicate with a capital of $10,000,000. This syndicate, it is said, will soon put the line through to Tallahassee.

There is water-works agitation at Cordele, Ga.; Pinckneyville, Ill.; Phillipsburg, Kan.; Clinton, Tenn.; Bonham, Tex.; Eagle Pass, Tex.; Elkins, W. Va.; Minkato, Minn.; Oakland, Cal.; Scranton, Pa.; Evarts, Mich.; Perth Amboy, N. J.; Watkins, N. Y.; Wolfville, Can.; Victoria, B. C.; North Des Moines, Ia.

The Hotchkiss & Upson Co., of Cleveland, Ohio, has sold its plant, machinery, tools and stock to the Upson Nut Co., who will assume and execute all unfilled orders and contracts. The Upson Nut Co. has heretofore had a large ownership in the Hotchkiss & Upson Co., and now merges that company's business into its own.

A large convention was held recenty at Tyler, Tex., to favor the construction of a railway from Pueblo, Col., southeasterly across the entire breadth of Texas to Alexandria, La., a distance of about 900 miles. Delegates were present from fourteen counties, and a committee was appointed to obtain subscriptions along the line.

The Canada Switch Manufacturing Company is applying for incorporation, for the purpose of manufacturing railroad switches and appliances. The chief place of business will be in Montreal, and the capital stock will be $50,000. The incorporators are K. W. Blackwell and Jas. Reid, of Montreal, and Chas. Scott, of Philadelphia.

A Springfield (Ohio) dispatch says: A polical revolution has broken out here among farmers and wage workers. A mass meeting largely attended was held at New Carlisle, and trusts, monopolies, syndicates, etc., were bitterly denounced. After a number of ringing speeches independent district and county candidates were nominated.

The Knitting Mills Company has been fully organized at Troy, Ala., and the following board of directors elected: Joel D. Murphree, Fox Henderson, T. K. Bramley, O. C. Wiley, Charles Henderson. The officers are: Charles Henderson, president; W. W. Haralson, secretary and treasurer; T. H. Crane, superintendent. A resolution has been passed to increase the capital stock to $40,000.

Warner & Swasey, Cleveland, Ohio, have issued a new illustrated catalogue of machine tools made by them. The catalogue is an excellent one, and gives illustrations and descriptions of the excellent line of machines they make. It is one of the catalogues that machinists and manufacturers should have at hand; it contains valuable information on gearing, and other suggestive matter.

The Moran Bolt and Nut Manufacturing Company's works, St. Louis, Mo., destroyed by fire March 13th last, have been rebuilt upon an enlarged and improved scale, so that now they have greatly increased facilities for turning out machine bolts, bridge bolts, gimlet point lag screws, coach screws, nuts, etc. A notice to this effect was issued to the company's customers under date of July 24th.

The Diamond Wrench and Tool Company, Portland, Me., have lately doubled the amount of their machinery in many departments, and are now in condition to employ 25 more men. They now make wrenches, hammers, hatchets, bit braces, locks, tack-claws, ice-picks and awls, screw-drivers, cotton-hooks and box-hooks. A. C. Libby is treasurer, E. L. Pickard superintendent, and Edgar Shaw traveling salesman.

The Daily Dry Goods Reporter says: The largest woolen mill west of the Mississippi, the Pioneer Woolen Factory, of California, is for sale. No dividends have been paid by this company for five years past, and it is claimed that there no longer exists a profit in manufacturing woolens. This is significant, when it is remembered what position California occupies as a wool-raising State, and how it has been fostered and protected.

A. C. McGraw & Co., of Detroit, Mich., are building a shoe factory at the corner of Woodbridge and Griswold streets, which is to be 80x110 feet in size, and six stories high, where they will manufacture men's and women's shoes. The building is to be completed February 1st. This firm is one of the oldest in the country. It was established as a jobbing house in 1832, and will prove a valuable accession to the ranks of Western shoe manufacturers.

Aug. 7, the firm of Brown, Steese & Clark, 149 Federal street, Lowell, Mass., made an assignment. It is one of the oldest and largest wool houses in the country. The liabilities are unknown. A tight money market and close scrutiny of paper led to the suspension. The death of Mr. Sturtevant, a heavy financial backer, a few weeks since, hastened it. The firm is interested in the Riverside and Oswego mills in Rhode Island, which have been attached.

The Sperry Motor Company has been incorporated at Chicago, to manufacture electric and other motors, and furnish power and heat. Capital stock, $50,000. Incorporators, Elmer A. Sperry, David T. Foley and William R. Goodman. A constant current motor, designed by Mr. Sperry, for use on arc circuits, which has given good satisfaction under severe tests, will be manufactured and placed on the market by this company.

The Northern Pacific & Manitoba Railroad has prepared plans and specifications for extensive building operations in the woods at Winnipeg, Man. A roundhouse of brick, with stone foundation, 270 ft. in diameter and 720 ft. in circumference, is to be built. Among other buildings to be erected will be a car repairing shop, 240x100 ft., solid brick with stone foundation, a blacksmith shop, 100x60 ft., and a two-story brick store building, 70x40 ft., with offices attached. The work will be pushed through as rapidly as possible as soon as the contracts are awarded. Oil tanks, pumps, etc., are to be put up.

The nail factory of Jones & Laughlins American Iron Works [Pittsburgh, Pa.,] started up again last Tuesday, after having been idle since the 1st of July. The new 26-inch mill of that firm is about ready to commence operations. This is a new department the firm have added to their establishment, and about 150 men will find employment here. The polishing mill at these works is being rebuilt. It was formerly a frame structure where about 350 men were employed. The firm are now putting up an iron building, and while the work is being done, not a man in the mill has stopped operations.—*American Manufacturer.*

Fred. J. Swaine [St. Louis, Mo.] has just completed a full set of new improved silver dry plate coating machines of various sizes, for the mechanical coating of dry plate, for the M. A. Seed Dry Plate Works. These coating machines are something entirely new, and are the invention of Mr. Swaine, who claims that, outside of other advantages possessed by them, they can turn out more work in less time and with less labor than any method heretofore employed. He has latelely shipped, and is now at work upon a large number of dies for local and outside firms. He mentions inquiries received from Texas, Buffalo, N. Y., and other places.—*The Age of Steel.*

The Pond Machine Tool Co., 113 Liberty street, New York, write us: We have just received an order from the New York & New England Railroad Co., for one of our steel tire turning lathes for turning steel tired wheels on their axles, which permits the use of a broad-faced tool, taking the entire tread of both wheels at one cut. This machine weighs about 23 tons, and is already in use on such roads as the Boston & Albany, New York & New Haven, New York, Lake Erie & Western, Chicago, Rock Island & Pacific, Northern Pacific, and other leading roads of the country. We also received the order of the N. Y. & N. E. R. R. for one of our improved 79″ driving wheel lathes, with double quartering attachment.

The Bennington (Vt.) Woolen Mills are being thoroughly overhauled by the new proprietors, Holden & Leonard. The machinery is in first-class condition, but new floors are being laid in the die-room and wash-room. The mill pond has been drained and cleaned out, a new flume and bulk-head built, and the trunk is now being repaired. The tenants of the company's houses have been ordered to find dwellings elsewhere, and as soon as the houses are vacant they will be re-painted, re-papered and renovated throughout. As soon as the wheel can be started they will commence to clean the machinery. About 25 men are now working about the mills. Although many expect that the mills will be started the middle of this month, yet September 15th will be the earliest date when they can be started.

Mention was recently made in these columns of the sale of the building, engine, etc., of the Cincinnati Corrugating Co., on Eggleston avenue, Cincinnati, Ohio. But we learn that this is merely one step in the important move the company is making towards occupying their new works at Piqua, Ohio. Among the new features of the business will be the manufacture of iron and steel sheets for their roofing, etc., under their own auspices. The large tract of land acquired just south of the flourishing city of Piqua will enable the two companies to extend their lines of specialties in many desired directions. The manufacture of all the sheet metal used by the company under their own immediate supervision is an advantage not easily estimated, in securing a uniform and superior quality.

The *Railway World* says: In 1887 there were 1,850 miles of railways in Switzerland, and in this length are included some of the most difficult examples of railroad engineering that have ever been accomplished. In the year named, 25,762,822 persons were carried on the Swiss railways, and 8,096,558 tons of merchandise. The total receipts amounted to £3,160,000, and the expense to £1,688,000; the capital expended in railroad construction was about £40,000,000, and the average interest paid on capital was 3.45 per cent. A total of 213 accidents of every kind are reported to have occurred on the system in 1887. Working to a large extent with the railways is the lake navigation, which in 1887 occupied 68 large passenger steam vessels. The construction of tramways has made but little progress in Switzerland, there being less than 20 miles in work; these, however, carried, in 1887, nearly 6,000,000 of passengers, with a profit of about 200,000 francs.

Throughout Maine, the towns having any facilities for manufacturing are fast joining in the competition of securing companies or individuals to locate some industry among them. The town of Monroe, in Waldo county, is but a few miles from Brooks, on the Belfast branch of the Maine Central Railroad, or by stage from Bangor. At a recent town meeting it was voted to exempt from taxation for ten years any person or company who will start a woolen mill in the village. They have a good stone dam, located on a ledge, and with a fall of 18 feet; while a short distance up the stream are several ponds, which could be flowed at a small expense, and thereby insure a supply of water through the dry season. Monroe is some 30 miles from any woolen mill, and is in a prosperous farming country, where there are many wool growers. The mills and privilege are now owned by C. A. McKenney, who would make reasonable terms, and, with many others of this town, take stock in the new mill.—*Industrial Journal.*

Machinists' Supplies and Iron.

NEW YORK, Aug. 17, 1889.

Iron—American Pig.—No important change has taken place in the general condition of the market, and prices are still quite firm. We quote, Standard Northern brands, No. 1 X Foundry, $17 to $18; No. 2, $16 to $17. Southern brands, No. 1, $16.75 to $17.25; No. 2, $16 to $16.50; Grey Forge, $14.50 to $15.25.

Scotch Pig.—We quote, Coltness, $22 to $22.50; Gartsherrie, $20.25; Summerlee, $21.75 to $22, Eglinton, $19 to $19.25; Dalmellington, $19.75 to $20; Clyde and Langloan, $20 75.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Position wanted in Chicago by a machine shop superintendent. Address Box 9, AM. MACHINIST.

Foundry foreman, 25 years' exp. on gen'l mach'y & locomotive work, wants position. Iron, AM. MACH.

Wanted—A first-class draftsman at once. Address J. L. Bogert, Flushing, L. I.

Wanted—Position as draftsman or foreman machinist by a practical man. D. M., AM. MACHINIST.

Wanted—Position by first-class man as foreman machine shop; good manager of men and a pusher; held similar positions. Box 14, AM. MACHINIST.

Foreman blacksmith would like situation; nine years' exp. on engine, mach., and gun tool forgings. Geo. R. Keasley, 45 Jefferson st., Hartford, Conn.

Wanted—First-class machinists and pattern makers; men familiar with pump or steam engine work p'f'd. Deane Steam Pump Co., Holyoke, Mass.

Wanted—First-class machinists. None others need apply. Wages $2.25 per day of 10 hours, with chance for advancement if found worthy. The Pond Machine Tool Co., Plainfield, N. J.

Wanted—A foreman for a small machine shop; must be a good mechanic with push and energy; state age and experience; also give reference. Address Box 12, care AMERICAN MACHINIST.

Wanted—A first-class master mechanic; must be familiar with boiler as well as mach. work. Address, stating age, qualifications and salary expected, Utley Wedge, care of Standard Oil Co., Cleveland, Ohio.

Wanted—By an old established house, a good, steady salesman for machinists' & engineers' supplies; one well acquainted with the business, & having personal trade in this line. Box 15, AM. MACH.

Wanted—Immediately, two or three good general machinists for lathe and floor work; good wages and steady situation for suitable men. Apply or address to Kenney & Co., Scottdale, Pa.

Wanted—A good draftsman, familiar with shop practice, capable of designing stationary engine work, and making detail working drawings; a permanent position to competent and steady man. Address Box 10, AMERICAN MACHINIST.

A mechanical engineer, thoroughly experienced in designing, estimating, mfg., also in constructing large works, etc., and who possesses excellent ability to manage or superintend, is open for engagement; location no object. A. M. T., Box 321, Chicago, Ill.

Wanted—Good machinists, accustomed to automatic engine work. Steady work and first-class wages to first-class men; none others need apply; desirable location for married men. Address Phœnix Iron Works Company, Meadville, Pa.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Cheap 2d h'd Lathes & Drills. S. M. York, Clev., O.

Koopman's Scales for quick measurements.

Just out; aluminum-steel hack-saws, hard but not brittle. Crescent Mfg. Co., Cleveland, O.

New catalogue of engineers' specialties free. Crescent Mfg. Co., Cleveland, O.

Light and fine machinery to order; Foot Lathe. Catalogue for stamp. E. O. Chase, Newark, N. J.

August C. Christensen, 24 State st., N. Y., Consulting Engineer. Designs of all kinds of Machinery.

Turned and Highly Polished Iron and Steel Shafting a specialty. Merwin McKaig, Cumberland, Md.

Complete list of our Scales and other new tools for 2c. stamp. A. T. Koopman, Chicago.

For Sale—A small machine shop; excellent opening. Asbury, Grieder & Co., Roanoke, Va.

For Sale—Good patent upon key-seating machine. J. L. Oefinger, 949 Va. Ave., Washington, D. C.

Designs and working drawings for special machinery, tools, etc. attended to by experienced draftsman. "Draftsman," Box 107, AM. MACHINIST.

Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., P. O. Box 1262, Phila., Pa.

Latest and best Planer and Drill Press Chucks, Expanding Mandrels. The Brightman Machine Company, Cleveland, Ohio.

Wanted—To buy second-hand lathes, planers and shapers of all sizes; must be cheap and in good order. Fosdick & Plucker, 6th and Culvert Streets, Cincinnati, O.

How to remove and prevent scale in steam boilers at a cost of ten cents a week. Send postal for circular to Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa.

Worcester (Mass.) Polytechnic Institute, trains Mechanical, Civil and Electrical Engineers, Chemists, Draftsmen. New and finely equipped laboratories and shops. H. T. Fuller, Ph. D., Pres. of Faculty.

Wanted—Party with capital or established shop, to join advertiser in the manufacture of milling machines for the market. Secretary, P. O. Box 83, Hartford, Conn.

A fine chance to get a permanent business, the patterns and patents of the "Shultis Pat. Sectional Bark Mill" for sale. Over 400 in use in the U. S. and Canada. Shultis & Co., Kingston, N. Y.

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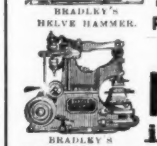

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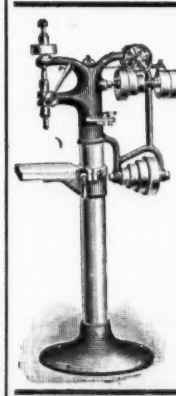

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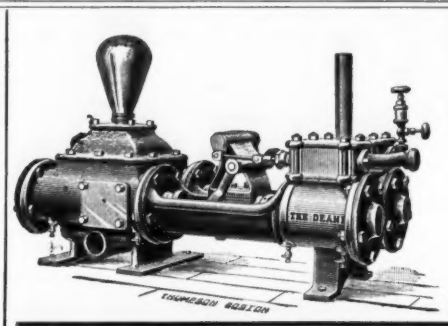

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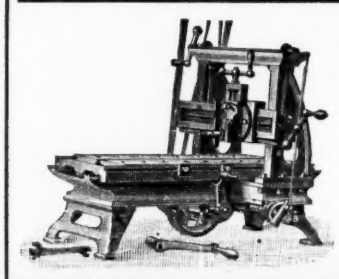

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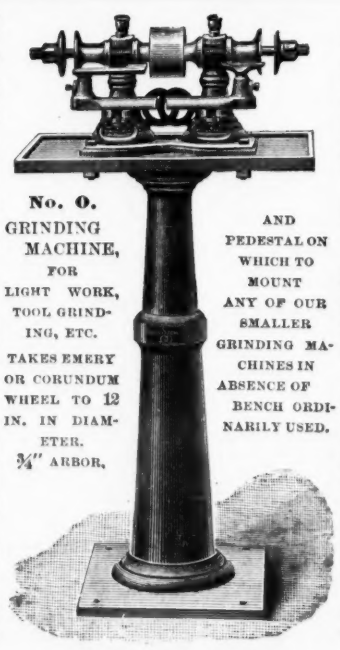

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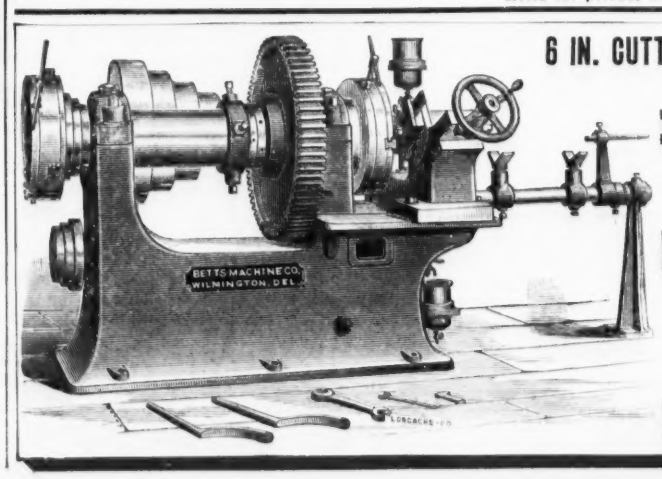

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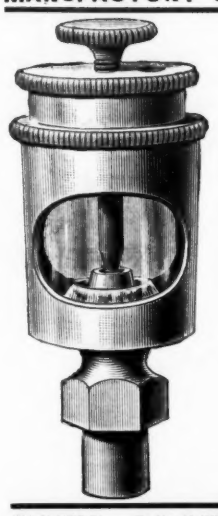

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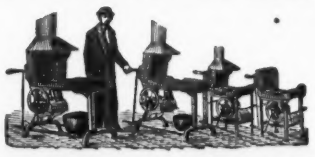

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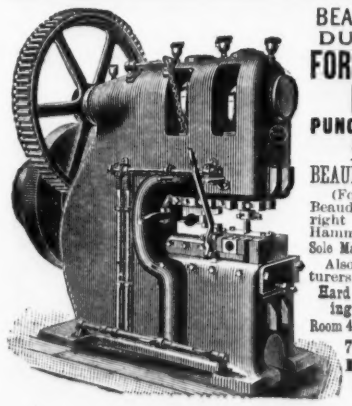

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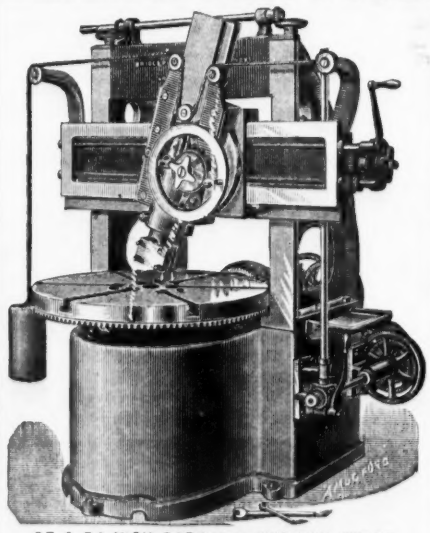

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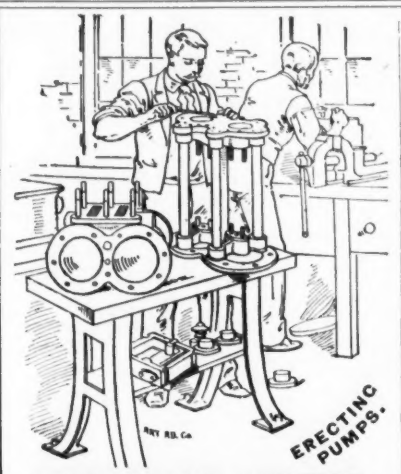

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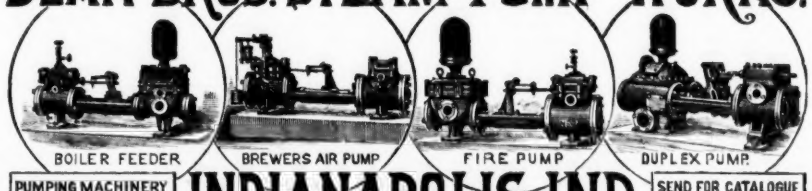

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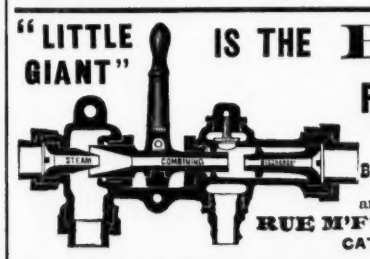

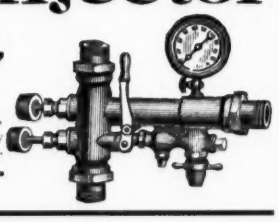

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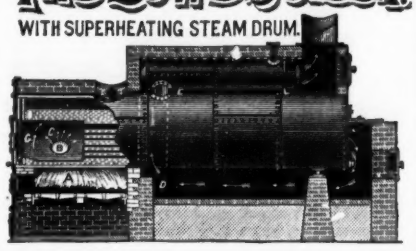

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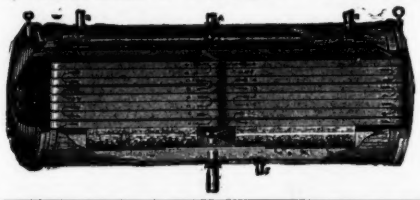

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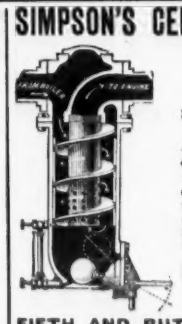

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2	3½ "	0 to 1 "
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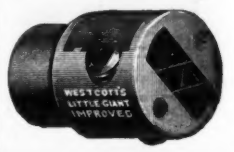

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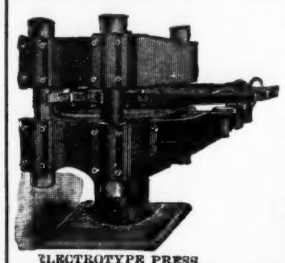

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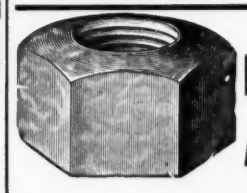

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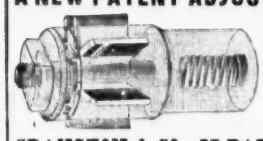

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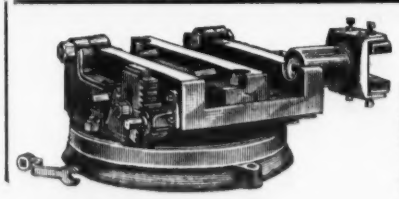

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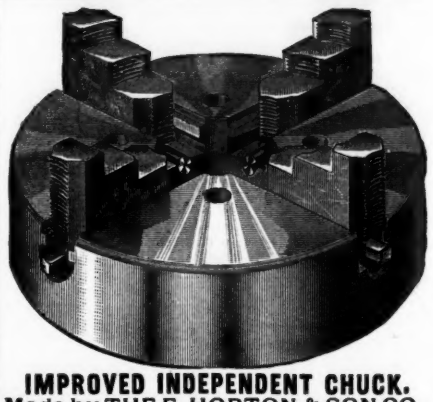

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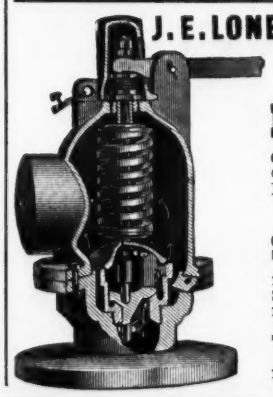

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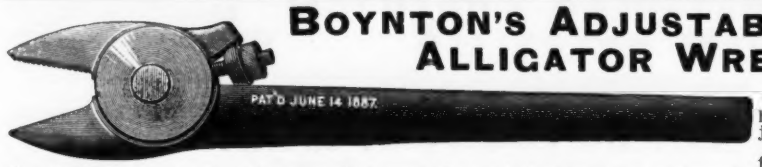

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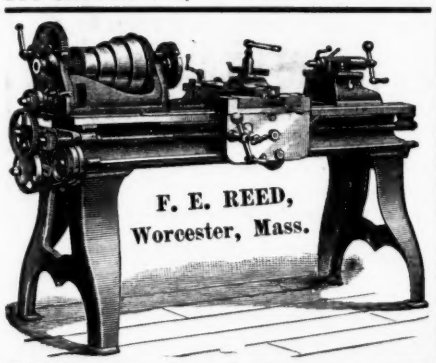

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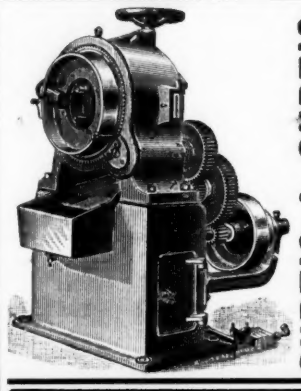

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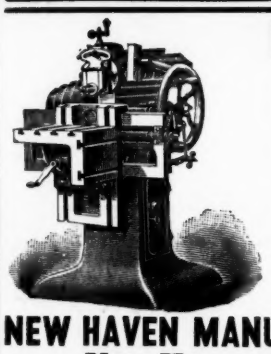

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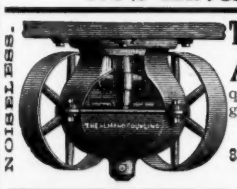

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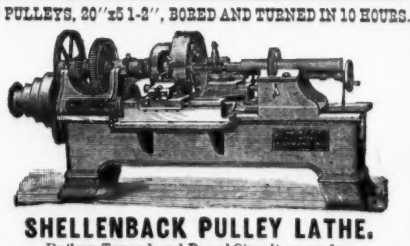

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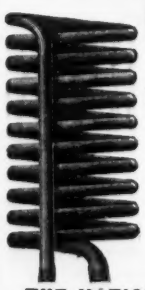

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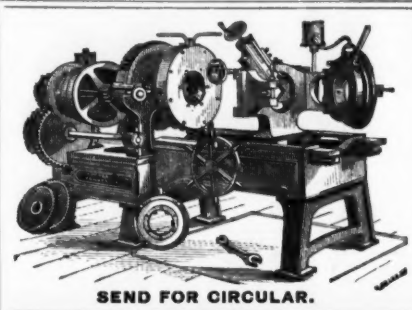

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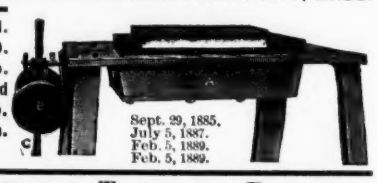

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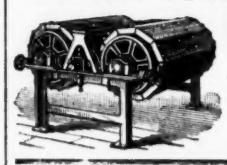

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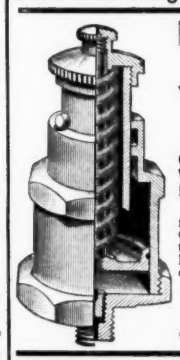

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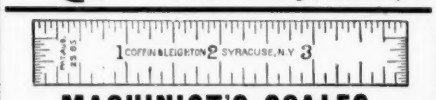

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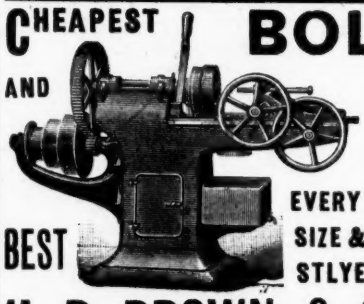

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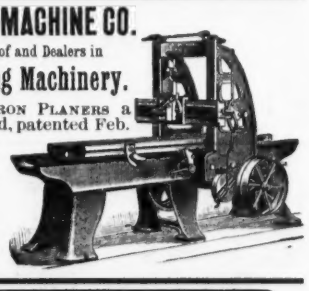

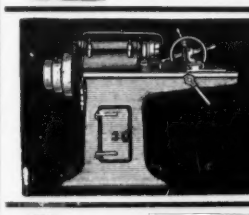

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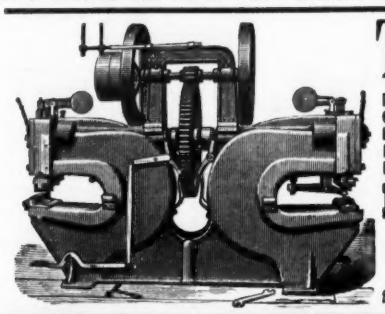

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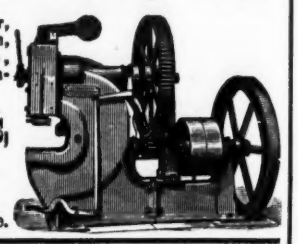

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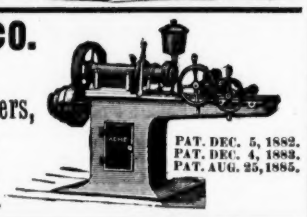

PAT. DEC. 5, 1882.
PAT. DEC. 4, 1883.
PAT. AUG. 25, 1885.

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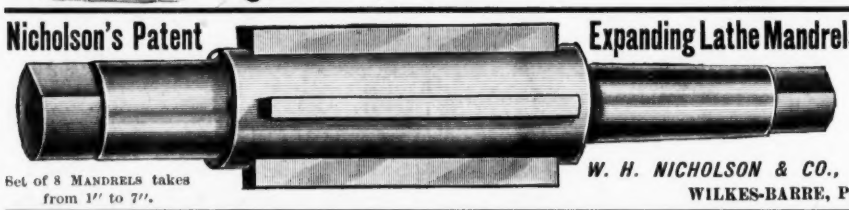

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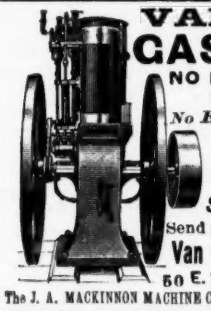

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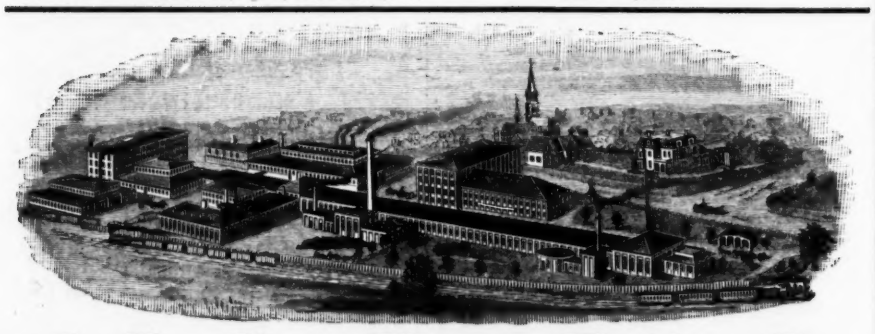

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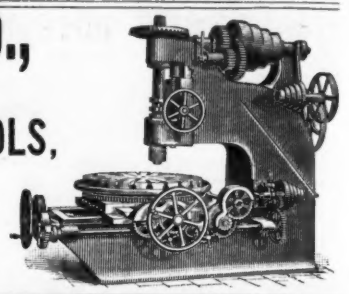

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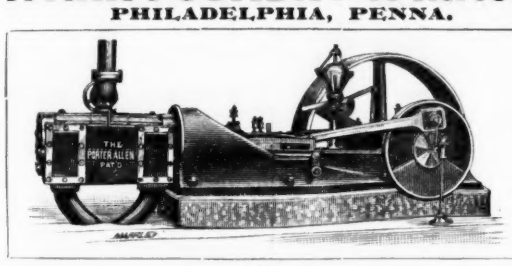

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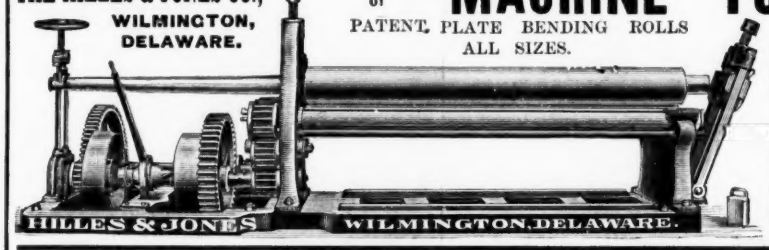

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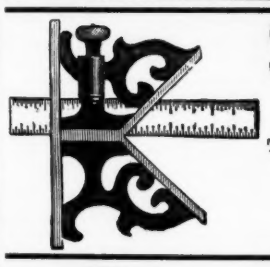

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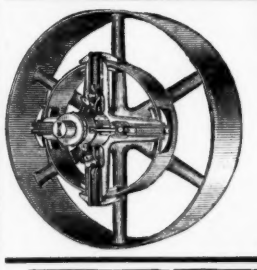

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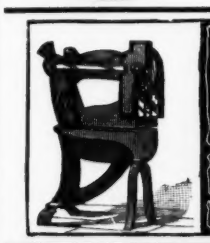

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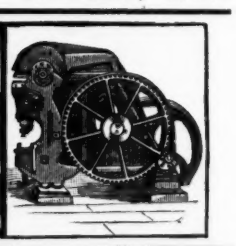

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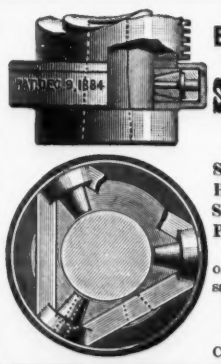

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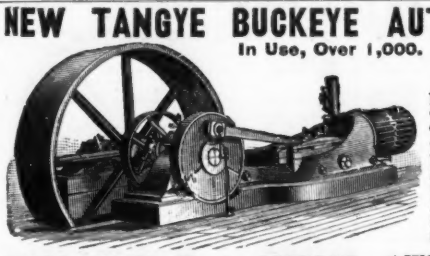

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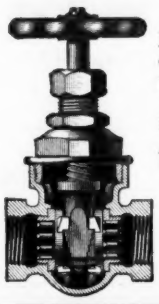

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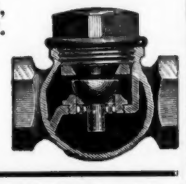

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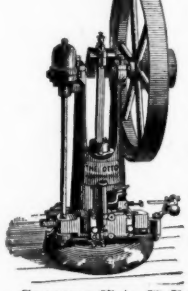

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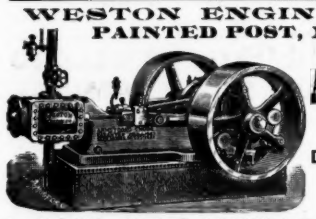

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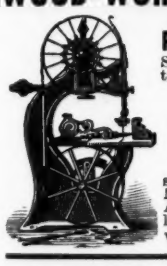

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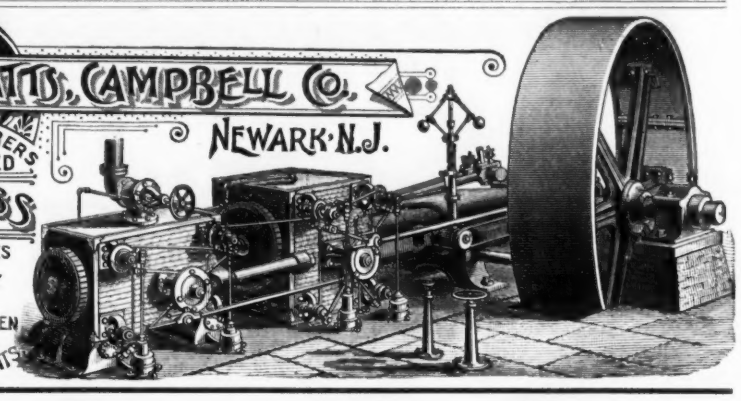

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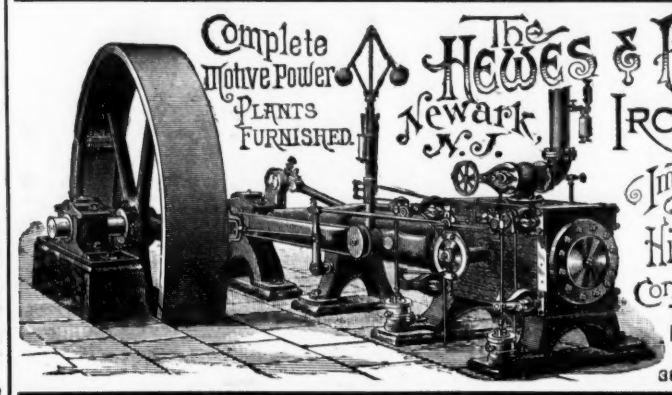

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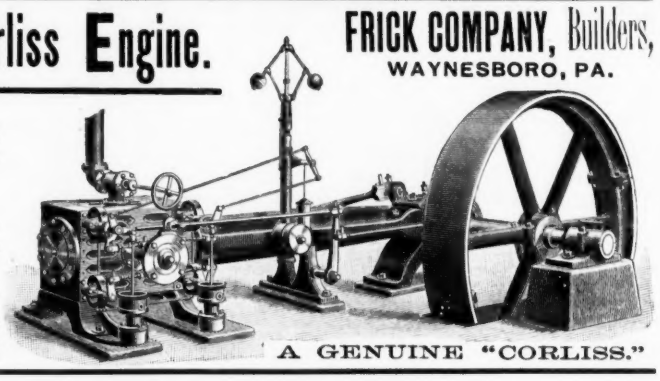

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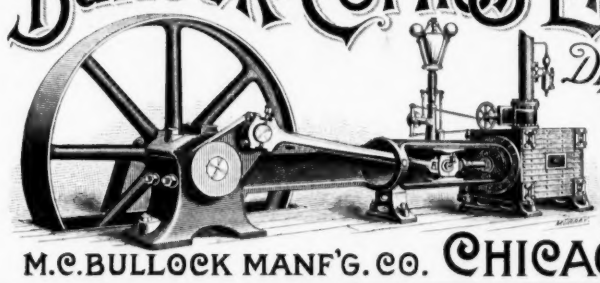

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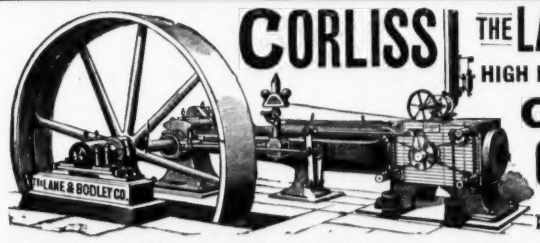

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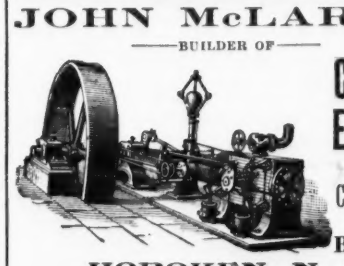

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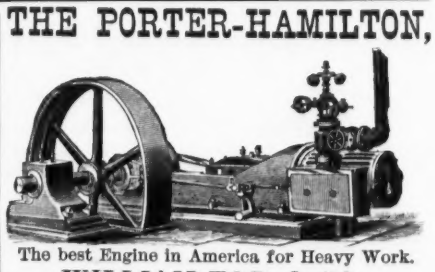

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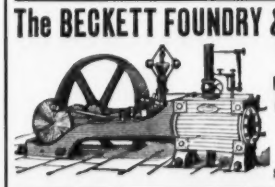

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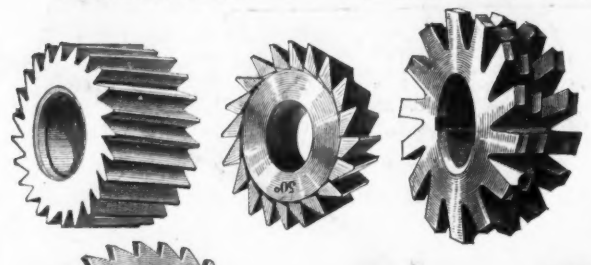

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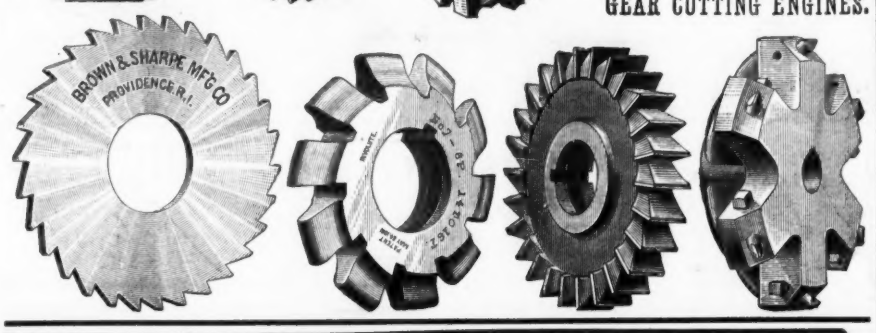

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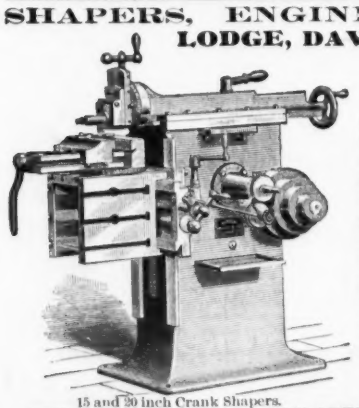

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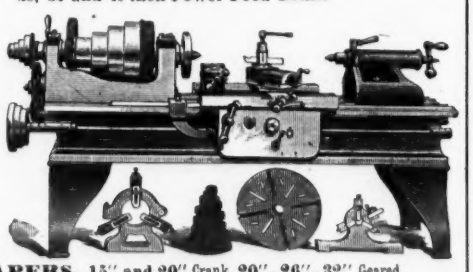

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EBERHARDT'S
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In Use throughout the World.

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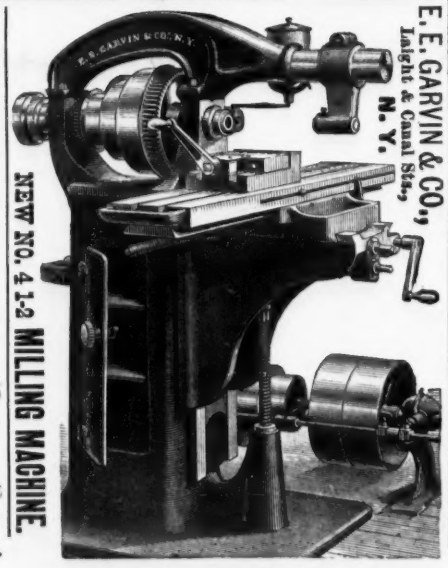

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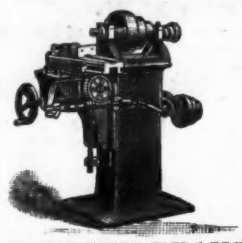

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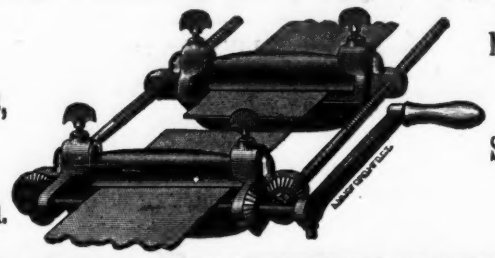

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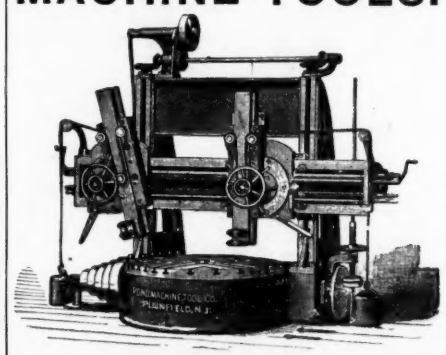

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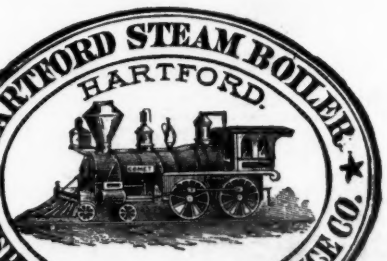

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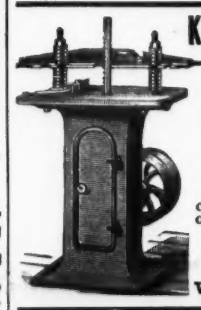

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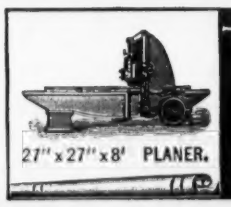

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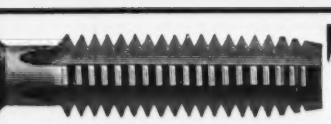

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